

80micro

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A WAYNE GREEN PUBLICATION

the magazine for TRS-80* users

®

THE MODEL 2000

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C•Notes
For the Model 100

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The left bracket, [, replaces the up arrow used by Radio Shack to indicate exponentiation on our printouts. When entering programs published in *80 Micro*, you should make this change.

80 formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

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80 Micro (ISSN 0744-7868) is published 12 times a year by Wayne Green Inc., 80 Pine St., Peterborough, NH 03458. Phone: 603-924-9471. Second class postage paid at Peterborough, NH, and additional mailing offices. Subscription rates in U.S. are \$36 for one year, \$55 for two years, and \$75 for three years. In Canada and Mexico \$45—one year only. U.S. funds drawn on a U.S. bank. Nationally distributed by International Circulation Distributors. Foreign subscriptions (surface mail), \$55—one year only. U.S. funds drawn on a U.S. bank. Foreign subscriptions (air mail), please inquire. In South Africa contact 80 Micro, P.O. Box 782815, Sandton, South Africa 2146. All subscription correspondence should be addressed to 80 Micro, Subscription Department, P.O. Box 981, Farmingdale, NY 11737. Please include your address label with any correspondence. Postmaster: Send form 3579 to 80 Micro, Subscription Services, P.O. Box 981, Farmingdale, NY 11737.

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Microfilm: This publication is available in microform from University Microfilms International. United States address: 300 North Zeeb Road, Dept. P.R., Ann Arbor, MI 48106. Foreign address: 18 Bedford Row, Dept. P.R., London, WC1R4EJ, England.

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It certainly has been an eventful year for the TRS-80 world. While most companies were introducing one or two new products, Tandy turned over nearly its entire line, in the process filling almost every conceivable niche in the microcomputer market.

Tandy has developed an interesting and unique approach: They're selling computers like an automobile company sells cars. No matter what your need, there's a TRS-80 for you (see the Table).

Want a nice, compact travel car? Then try the Model 100. How about a durable pickup truck? You might test-drive the Model 4. Need a family vehicle? The Color Computer could fill the bill. If you need a van for lots of storage, you'll be interested in the 16B. Tandy can even give you a moped with the MC-10.

And now, to top it off, they've introduced their version of the Mercedes-Benz—the Model 2000. It'll not only get you where you're going, Tandy promises, but it'll get you there with style.

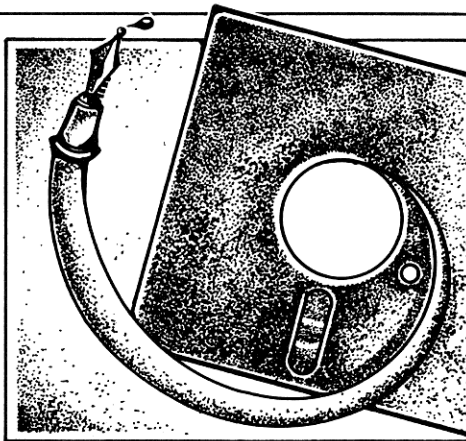
Tandy's machines come with a variety of engines. The Model 100, for example, has a fuel-efficient 80C85, while the 16B uses a powerful 68000 gas guzzler. The newest entry, the 2000, has a zippy 80186. And, of course, there's still the Z80, the slant six of microcomputers.

Want CP/M? They've got it. How about something with Unix? Step over here for a minute. Want to look at a machine with MS-DOS? Here's a sleek new beauty for you. Even TRSDOS is still in stock.

From a marketing perspective, Tandy's strategy has a lot going for it. They've managed to cover all the bases. No matter which road the consumer travels, Fort Worth is prepared to follow.

And they've put some pep back into the TRS-80 line. Those who have complained about the dull, conservative, grey suit the Tandy computers have worn can no longer gripe. TRS-80 users are going to see a lot of excitement over the next year or so.

But such a course is also fraught with danger. For starters, Tandy is making little effort to define each computer's market: The company expects the ma-



Like new, low mileage

chines to sort themselves out. While the people at Fort Worth express confidence that the various computers will find their places—or, perhaps more accurately, that their places will find them—the possibility exists that different models will end up competing with one another. How, for example, will the Model 2000 affect Model 12 sales? Will the 4P hurt the 4?

Also, the number of systems could confuse the average consumer. Which TRS-80 to buy? While the careful and intelligent shopper will take the time to

figure out what's right for him, many others will find it easier to simply go out and get an IBM or an Apple.

The responsibility to educate the potential customer will rest with the Radio Shack store clerks, many of whom lack the necessary in-depth knowledge of the systems and their capabilities. Training its employees may turn out to be one of Tandy's biggest challenges.

Then there's the question of whether Tandy can give proper attention to each system. They've been slow to respond to shifts in the marketplace before; will this slow them even more? Will they, for instance, move quickly enough to upgrade the Model 100 in the face of the many new portables being introduced? Tandy has a lot of plates spinning at once, and they'll need quick hands to keep them from falling off their sticks.

The fact that Tandy has been able to come out with so many computers in such a short time is a tribute to their manufacturing and marketing skills. Here's hoping they can follow up on their promises.

The Model 4P

Tandy's timing was perfect—their 1984 catalog with the new transportable, the 4P, came out just as Osborne Corp. was going belly-up.

The 4P is a nice machine. It's the first transportable we've seen that is also an attractive desktop computer. It's a far sight sexier than the Kaypro, which looks like World War II vintage radio gear. The 4P's features, along with Radio Shack's CP/M, should make it competitive in the transportable market.

Unfortunately, Tandy chose not to market the 4P aggressively. This is, in some respects, understandable—the machine could very well take sales away from the Model 4.

But on the other hand, the 4P enters a market in which there is no longer a dominant leader. Tandy has the chance to take control, much as they did with the Model 100 in the portable field.

The Osborne was a boat anchor, and it sold like proverbial hot cakes. The 4P is a superior product. Tandy should re-evaluate their marketing strategy, and take advantage of this chance while they've got it. ■

Model	Price
PC-4	\$69.95
PC-3	99.95
MC-10	119.95
PC-2	199.95
CoCo 2	239.95
CoCo 2 (Extended)	319.95
CoCo (64K Extended)	399.95
Model 100	799.00
Model 4 (cassette)	999.00
Model 4P	1799.00
Model 4	1999.00
Model 2000	2750.00
Model 12	3199.00
Model 16B	4999.00
Model 16B Multi-user system	8397.00

You need a scorecard to keep track of the players: Tandy's current lineup. (Prices are for basic units, as shown in the 1984 catalog.)

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Monitor, graphics and Digi-Mouse not included



Compare the Tandy TRS-80 Model 2000 to the IBM® Personal Computer

Price Comparison*	Tandy Model 2000	IBM Personal Computer
Base Unit	\$2750	\$2104
2nd Drive	Included (720K)	\$529 (320K)
Monochrome Monitor	\$249	\$345
Display/Printer Adapter	Included	\$335
128K RAM	Included	\$165
RS-232	Included	\$120
MS-DOS 2.0	Included	\$60
Total Cost*	\$2999	\$3658
Feature Description	Tandy Model 2000	IBM Personal Computer
Internal Memory	128K Standard	64K Standard
Disk Capacity Per Drive	720K	160K or 320K (optional)
Microprocessor Clock Speed	8 MHz	4.7 MHz
True 16-Bit Microprocessor	Yes (80186) 16-bit/16-bit data path	No (8088) 16-bit/8-bit data path
User-Available Expansion Slots*	4	2
Graphics Options		
Color Resolution	640 x 400	320 x 200
Number of Colors	8	4
Monochrome Resolution	640 x 400	640 x 200

*Comparable IBM configuration with monochrome adapter and display, communications adapter, two 320K disk drives and 128K RAM.
†Manufacturer's pricing as of 9/1/83.

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Monte Bug

My Monte program ("The Business of Planning," September 1983, p. 74) has a problem in the calculation of the standard deviation. Line number 8880 does the standard deviation calculation and uses variable ME(X), the mean, in its calculations.

However, the program does not calculate ME(X) until line 8890. Retype line 8880 as line 8895, or move it using a utility such as the DI command in NEWDOS/80.

To convert the program to another machine or language, I use a statement in line 180 that uses a PEEK (16539). This gets around the Model I's limitations of not letting the printer tab past the sixty-fourth column. You can delete this line for other computers.

Also, lines 4860, 4870, 4930, and 8080 use the FNB function, but you can replace this with a tab.

Ronald Cangro
7628 Regina Drive
Fort Wayne, IN 46815

Diagnostic Program Reviews?

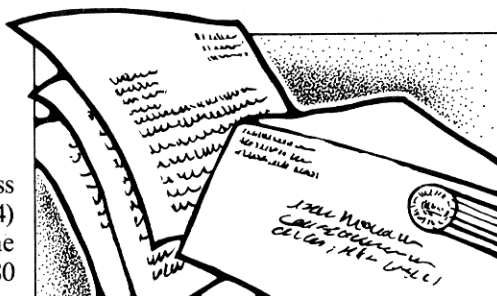
The Wisconsin School Bus Association operates a Model III in a small office business environment. We use it in so many phases of our daily operation that down-time cripples us badly.

We have a few diagnostic programs, but don't know if they are effective. Surely some good diagnostic programs exist in the market that can thoroughly check our computer and its peripheral equipment, but we cannot evaluate their effectiveness.

Your reviewers might offer an invaluable assistance to many readers if they would field test and rate diagnostic programs. We have no other source of credible information on these programs.

Dick Rechlicz
Executive Secretary
Wisconsin School Bus Association
2830 Brookfield Road
Box 403
Brookfield, WI 53005

We plan to cover the various diagnostics packages early in 1984.—Eds.



Datapoint on ARCNET

I enjoyed the article, "ARCDOS for ARCNET," by Joseph Trojak (August 1983, p. 188). Although Dr. Trojak has a good grasp of the ARC network system, his article contains several misconceptions.

The terms ARC and ARCNET are registered trademarks of the Datapoint Corporation. The ARCNET network is the physical processing/office automation system.

ARC system, or ARC, is the total distributed architectural system, including software and processors, Datapoint uses to provide office automation functions. Dr. Trojak indicates that ARC is the operating system when in fact ARC system is the overall concept.

The basic philosophy behind the ARC network system is not the dedication of one or more processors to disk management, but the ability to attach multiple processors to share common resources (files, printers, storage devices, and communications facilities).

The requirements of the disk operating system demand that common resources be maintained by dedicated processors. A file processor or a processor dedicated to managing files is required to enable sharing of that file resource to the system.

The differentiation with the RMS operating system is that the dedication is no longer mandated. RMS is a multiple-tasking operating system where tasks can manage resources and can run in the network, rather than on a dedicated machine.

Datapoint's ARC systems are not incompatible. The Datapoint 1800 series operates under DOS.G.; our 1560 processors operate under DOS.H, and our integrated office systems operate under DOS.D (3800s and 8600s). Since the ARC network supports multiple operating systems concurrently, you can transfer files between versions easily.

Both DOS and RMS operate within the ARC network with a maximum interprocessor cabling run of four miles.

Finally, the ARC network system and ARCDOS can operate on the same network, but the file structure is incompatible.

Alan Malingier
Senior Manager, Product Marketing
Datapoint Corp.
9725 Datapoint Drive
San Antonio, TX 78284

Trojak's Response

Mr. Malingier's definitions of the ARCNET network and ARC system, and his statement of philosophy behind ARC are consistent with Datapoint literature. I will not argue with Datapoint's unique definitions.

However, although ARCNET easily handles the transfer of files between versions of DOS, a program written for a Datapoint minicomputer (e.g., the 3800) cannot be executed by a Datapoint microcomputer (e.g., the 1500). File compatibility is not system compatibility.

Finally, it is true that several vendors offer networks based on the ARCNET technique. Although the networks are electrically compatible with all the Datapoint equipment, they are not compatible at the LNOS level (ISO level 3) with ARC. For example, Netstar Systems' PLAN 4000 uses ARCNET for its electrical connections, and the Xerox Network System at the LNOS level.

Joseph E. Trojak
Johns Hopkins Hospital
600 North Wolfe St.
Baltimore, MD 21205

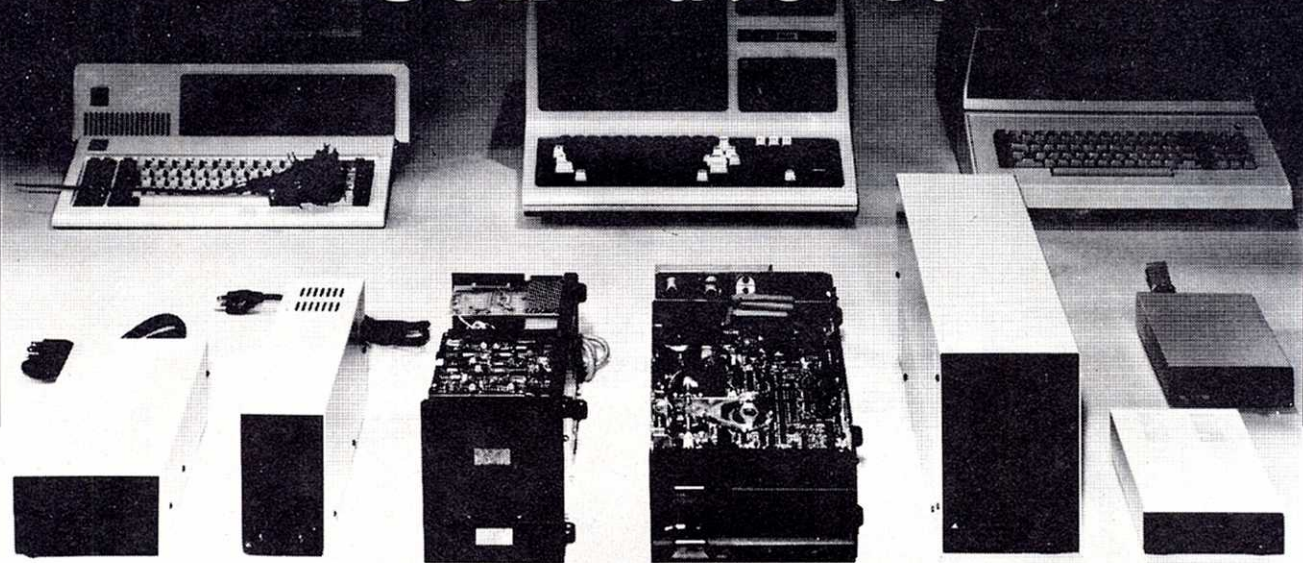
Powersoft on PowerDOT

Richard Green's review of PowerDOT (October 1983, p. 80) gave the product a fair and reasonable workout. Unfortunately, he reviewed an older, outdated version of PowerDOT: PowerDOT and its manual have undergone a complete rewrite.

PowerDOT II is a much better package. It sports a 60-page manual in a loose-leaf binder, and contains examples, screen dumps, and explanations.

Continued on p. 12

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Tandon*	5 1/4" TM100-4	2	80/80	Full	319.00
MPI*	5 1/4" Model 51	1	40	Full	179.00
MPI*	5 1/4" Model 52	2	40/40	Full	239.00
MPI*	5 1/4" Mdl 501	1	40	Slimline	179.00
MPI*	5 1/4" Mdl 502	2	40/40	Slimline	239.00
MPI*	5 1/4" Mdl 902	2	80/80	Slimline	329.00
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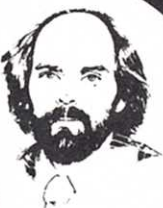
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Gemini 10X by Star Micronics	\$299.00
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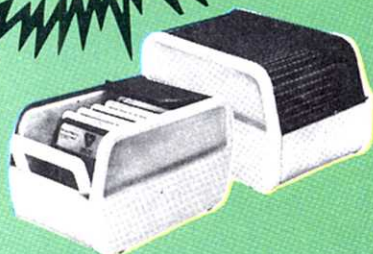
The #1 best selling program for home and small business accounting is now available for TRS-80 Model 3. Handles up to 99 accounts, five checkbooks, multiple income accounts, and can split transactions to any number of accounts. Prints net worth statements, income statements, as well as custom designed reports. Displays a bar chart and trend for any selected category. It is easy to use and yet provides all the power you'll need. (By Continental Software, requires Model 3, 2 drives, 48K.) \$62.95

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Continued from p. 8

tions of new features.

To facilitate new drawing, we added a Circle command, an adjustable Angle command, and a Scroll command. We also have a hardware interface available for drawing and design using the Radio Shack Color Mouse on the Model III or 4.

Other new features include the ability to create graphics character sets that users can save to disk and use to create other screens, and compatibility with all DMP series Radio Shack printers.

Hopefully, this letter sets the record

straight on PowerDOT II.

*Dennis A. Brent
Powersoft Products
11500 Stemmons Freeway, Suite 125
Dallas, TX 75229*

New Docs for LDOS Toolbox

Jim Heid did a fine job reviewing "The LDOS Toolbox" (September 1983, p. 200).

Jim mentioned that although he loved the software and gave it an excellent review, he was not completely hap-

py with our documentation. Since his review, we have rewritten the documentation, and were able to incorporate Mr. Heid's suggestions and some new additions, including the elimination of reduced print size.

We typeset the entire manual and it is much more readable and usable than before.

Thank you for this opportunity to update Mr. Heid's review, and for an informative magazine.

*Dennis A. Brent
Powersoft Products
11500 Stemmons Freeway, Suite 125
Dallas, TX 75229*

Error Trap

In our Directory of Software Manufacturers and Distributors (October 1983, p. 196), we erroneously listed J.F. Consulting, of Palm Desert, CA, as a software dealer.

J.F. Consulting is out of business, and RCM Computers (221 Hirschfield Drive, Williamsville, NY 14221) now supports their products.

Also, the address and software categories for Logical Systems Inc. (p. 220) were in error. Logical Systems Inc. (8970 N. 55th St., P.O. Box 23956, Milwaukee, WI 53223) markets software in the following categories: compilers, custom software, education, inventory control, inventory, operating systems, plotting/graphics, program generators, programmer aids, and utilities.

Small Computer Co. was also ac-

cidentally omitted from the October software directory. Small Computer Co. (230 W. 41st St., Suite 1200, New York, NY 10036) developed Radio Shack's Profile data-base manager, and sells enhancements for it.

International Software Sales Inc. was accidentally omitted from our Business Software Buyer's Guide (September 1983, p. 152). ISSI (P.O. Box 233, Newtonville, NY 12128) markets the following programs: Multi-company processing, general ledger, accounts receivable, accounts payable, inventory, payroll (with or without job costing), order entry, delivery ticket control, club management system, engineering, and professional management.

Software Legalities

Regarding Carl Oppedahl's review of *Legal Care for Your Software*, by Daniel Remer (August 1983, p. 76), I am writing a book for Prentice-Hall on the same subject, and wish to express my disagreement with Mr. Remer's approach.

My main objection to *Legal Care for Your Software* is the pull-out forms the author provides. These forms do the public more harm than good.

It takes many long, hard hours of study and work before you can become a lawyer skilled in microcomputer law, yet the author (and reviewer) expects the reader to use Remer's forms to draft his own legal forms.

This is a serious mistake. It's the same as reading your first book on Basic and then trying to write a complex Basic program. It's simply not that easy.

The general public does not always understand the implications of what specific contract language means. For example, in many of his forms Remer implies that the prevailing party will get his attorney's fees paid. A clause like that is the same as playing Russian roulette. The plaintiff always expects

```
CLS:PRINT@271,STRING$(33,176):FORI=335TO783STEP64:PRINT@I,CHR
$(191):PRINT@I+32,CHR$(191):NEXT:PRINT@784,STRING$(31,176)
30 PRINT@87,"*** M E N U ***":PRINT@920,"OPTIONS DESIRED ?"
40 PRINT@403,"1 XXXXXXXXXXXXXXXXXXXX":PRINT@467,"2 XX
XXXXXXXXXXXXXXXXXXXX":PRINT@531,"3 XXXXXXXXXXXXXXXXXXXX":PR
INT@595,"4 XXXXXXXXXXXXXXXXXXXX":PRINT@659,"5 XXXXXX
XXXXXXXXXXXX":PRINT@723,"6 XXXXXXXXXXXXXXXXXXXX
50 FORI=405TO725STEP64:PRINT@I,"<->":FORK=1TO50:NEXT:PRINT@I,"
":IK$=INKEY$:IFIK$="":THENNEXT:GOTO50ELSEIFVAL(IK$)<1ORVAL(IK
$)>6THENNEXT:GOTO50ELSE60
60 ONVAL(IK$)GOTO70,80,90,100,110,120
70 CLS:PRINT"OPTION 1 PRESSED":END
80 CLS:PRINT"OPTION 2 PRESSED":END
90 CLS:PRINT"OPTION 3 PRESSED":END
100 CLS:PRINT"OPTION 4 PRESSED":END
110 CLS:PRINT"OPTION 5 PRESSED":END
120 CLS:PRINT"OPTION 6 PRESSED":END
```

Program Listing. Menu modification program.

80 ALERT

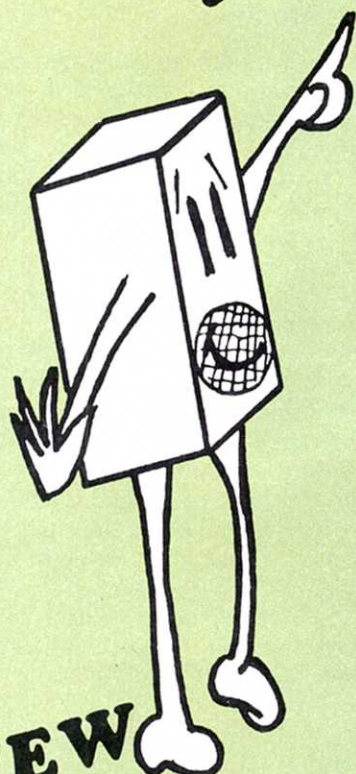
Thomas Holmes, president of Lindbergh Systems Inc., has informed *80 Micro* that his company has moved from 41 Fairhill Road in Holden, MA, to 49 Beechmont St., Worcester, MA 01609. All correspondence should be sent to this new address.

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to win, but if he loses he must pay the defendant's attorney fees.

*L.J. Kutten
Attorney at Law
201 South Central
P.O. Box 16185
St. Louis (Clayton), MO 63105*

Oppedahl's Case

In law, as in any other field, the danger exists that a lay person might come to harm trying to do something that would be better done by a professional. I share Mr. Kutten's view that a do-it-yourself book might promote this.

Not everyone who writes and sells software, however, can afford the attorney's fees needed to negotiate, draft, and sign a publishing contract. In addition, many writers end up dealing with organizations whose experience, legal talent, and financial resources far exceed their own.

For those writers, only two choices exist: deal with the publisher completely unprotected, or with the aid of a book like Legal Care for Your Software.

I agree with Mr. Kutten that problems exist with preprinted pull-out forms, especially because of differences in state laws. I suspect very few of the forms will actually be signed as they are.

The forms are, nonetheless, useful in

at least two ways. If an author negotiates a contract from scratch, the forms provide a checklist of areas to cover. Also, when a publishing firm presents a writer with a publisher's standard contract, these forms provide a relatively neutral source of alternative language for the clauses that the writer wants to try to change.

Parties in a position of bargaining power (credit card companies, for example) routinely offer their take-it-or-leave-it contracts with a one-sided clause stating that their legal fees will be paid by the other party in the event of a litigation. My view is that such a clause, if present in a contract at all, should be written to apply to both parties equally.

*Carl Oppedahl, J.D.
99 Park Ave.
New York, NY 10016*

Software Rip-Offs

I am writing to you in response to Computer Shack's letter in September 1983 Input (p. 16) griping about software piracy.

I admit that piracy is a great problem to software authors, but companies that rip off software ideas created by others are just as bad.

Computer Shack is very bad about this. They often are not original in the themes of their games. Most of Com-

puter Shack's games are rip-offs of other people's ideas, and software authors who go to the trouble of creating original games are being hurt by this.

*David Smith
Box 17367
Mississippi State University
Starkville, MS 39762*

Menu Modifier

Most menu-driven programs have boring menus, so I designed a menu (see the Program Listing) to use in the programs I write. The program adds some life to my menus and doesn't stare back when I'm deciding which option to choose.

Line 10 clears string space. Line 20 draws the square that holds the menu options, and could be used as a subroutine for many different menus if you include a Return command. Lines 30 and 40 display the exact options available. Replace the Xs in the program with your own options.

Line 50 lets you change the value of K to determine how fast the (-) scrolls through the menu and does all the necessary testing.

Line 60 determines to what part of the program control passes after the operator has determined the option.

*Barry F. Balliet
3402 Pine Lake Village
Lindenwold, NJ 08021*

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✓527

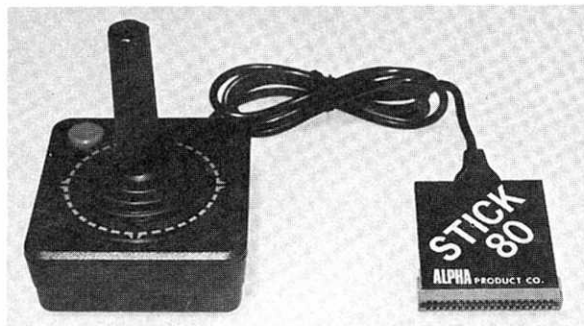
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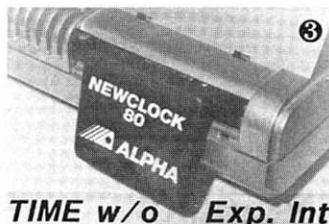
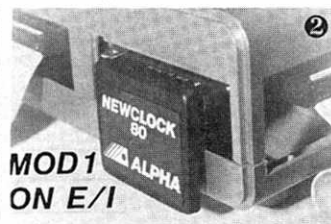


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Model IV: order model III version

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Wouldn't it be nice if your computer could always boot up with the right time and date and then stay accurate. Newclock-80 will enhance your Model I or III system with powerful clock/calendar/timer functions.

Using LSI (large scale integration) and custom circuits, Newclock-80 provides MO/DATE/YR, HR:MN:SEC plus AM/PM and day of week and even takes care of leap years! It continues to keep time and date with quartz accuracy when the computer is turned off or experiences a power failure. A single battery lasts over 2 years.

Compatibility: Newclock-80 is compatible with any operating system, including DOSPLUS, NEWDOS, LDOS. With its fully decoded circuitry it will work with any other hardware you may own. Bus expanders are available.

Installation is very simple, no tools, no disassembly, no soldering. Just plug it in, that's all. There is no power supply or messy cable. Newclock-80 plugs into the rear of the keyboard ③ or side of the Exp. Int. ②. Model III Newclock fits the 50 pin card edge (underneath) ①

The Software: Newclock-80 is as easy to use as it is to install. -"SET", a Basic program, is used only once to set the time and date and select 12 or 24 hour format. -"TIMESTR", also in Basic, patches your computer "TIMES" function to read Newclock-80. It also adds "TIMES" to keyboard-only systems, a short routine is simply "poked" into low memory.

Newclock-80 uses 12 ports (176 to 188): 6 for the time, 6 for the date. The data is conveniently stored in decimal form, no conversion is needed. You can read or modify any digit using simple Basic "INP" and "OUT" statements.

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Cassette Port Readings

How is it possible to deduce both amplitude and frequency through the cassette port? Also, what happened to EDF's Sound Stix program, and how can I get a copy of it? If anyone has a copy, I'm willing to pay photocopying and mailing costs for it.

Rick Sayre
4922 Cozad Way
Stockton, CA 95212

TTS Code

I need to contact someone who has worked with a TTS code system. I need information on an interface that will convert output from a Model III into TTS code readable by a GNT six-level paper punch.

Tom Baker
Box 97
Waitsburg, WA 99361

Linear Graphics

I'm searching for a machine-language routine that will draw a line from point to point on my Model III. I could also use some information on machine-language voice sound effects. Can someone help me?

Curt Salada
102 Log Cabin Road
Perkasie, PA 18944

Crossword Generator

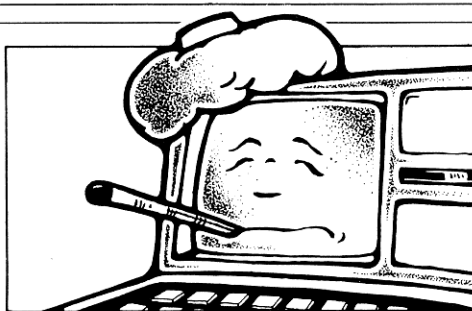
I've been unable to find a crossword puzzle generator for my Model 4 and Okidata 92 Microline printer. Does anyone know of a company or an individual that has such a program on the market?

Kim Wehmeyer
802 Susquehanna Ridge
Independence, MO 64056

Stringy Floppy Writing

Does anyone know how to adapt the original cassette version of Electric Pencil for use with the Exatron Stringy Floppy?

Dave Moore
574 Tweedsmuir Ave.
Ottawa, Ontario K1Z 5P2
Canada



Looking for answers

Radar Simulation Program

The Florida Institute of Technology is interested in running a Coast Guard-sanctioned radar proficiency course for ship pilots. We are looking for a Model II or III program that simulates the radar device and generates analog-to-digital coordinates to a radar rig. Can anyone help us out?

Joseph P. Pandolfo
Computer Lab Manager
Florida Institute of Technology
1707 N.E. Indian River Drive
Jensen Beach, FL 33457

New Computer Club

I'm a high school student interested in starting a computer club. Does anyone have any information on how to go about this?

Tim Pickenheim
RD #3, Box 244-B
Moscow, PA 18444

A Gift from Tandy

Tandy has given me an extra feature on my Model III Disk Basic that isn't mentioned in the manual or promised in their catalog. When I scroll through a program with the arrow keys, I lose 2 bytes of free memory for every line I scroll. Has anyone encountered this bonus feature and found out how to fix it?

Nate Salsbury
608 Madam Moore's Lane
New Bern, NC 28560

Chip Control Codes

I'm looking for some information on the WD1793 floppy disk controller used in the Model III. I already have the Model III reference manual, but what I really need are the control codes for the chip. Does anyone know where I can find additional information on this chip?

Scott Goehring
6205 North Tuxedo
Indianapolis, IN 46220

Help!

I'm looking for a Help file for my Model III version of LDOS 1.5.3 that's comparable to the PHELP/CMD The Toolbox uses. If you have a program like this, please contact me.

Terry Tanski
Box 299
Boyle, Alberta T0A 0M0
Canada

DMP Modification

Does anyone have a patch for Model III TRSDOS 1.3 that will display the entire error message rather than just Error X?

Also, does anyone know of a modification for the DMP 200 printer that will let me software-select the CR/NL DIP switch so I can switch from using the underline feature of Electric Pencil to list or print a Basic program on a different disk without wearing out the switch?

Robin L. Salmansohn
1855 Woodland Road
Abington, PA 19001

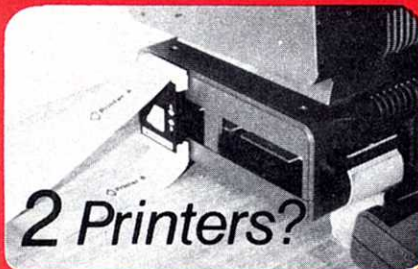
File Name Expansion

I'm looking for a way to expand the size of TRSDOS's directory beyond the current 80 file-name limit. My wife has a lot of recipes that she stores on disk, but she gets a Disk Full message after entering 80 file names even though there is still three quarters vacant space remaining. Does anyone have any suggestions?

William E. Baker
2419 Queen Ridge Drive
Independence, MO 64055

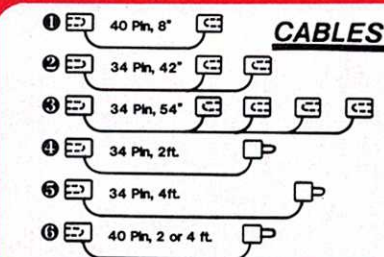
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GREEN SCREEN WARNING

IBM and all the "biggies" are using green screen monitors. Its advantages are now widely advertised. We feel that every TRS-80 user should enjoy the benefits it provides. But **WARNING:** all Green Screens are not created equal. Here is what we found:

- Several are just a flat piece of standard colored Lucite. The green tint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.
- Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobbly film gives it a poor appearance.
- One "optical filter" is in fact plain acrylic sheeting.
- False claim: A few pretend to "reduce glare". In fact, their flat and shiny surfaces (both film and Lucite type) ADD their own reflections to the screen.
- A few laughs: One ad claims to "reduce screen contrast". Sorry gentleman but it's just the opposite. One of the Green Screen's major benefits is to increase the contrast between the text and the background.
- Drawbacks: Most are using adhesive strips to fasten their screen to the monitor. This method makes it awkward to remove for necessary periodical cleaning. All (except ours) are flat. Light pens will not work reliably because of the big gap between the screen and the tube. Many companies have been manufacturing video filters for years. We are not the first (some think they are), but we have done our homework and we think we manufacture the best Green Screen. Here is why:
- It fits right onto the picture tube like a skin because it is the only **CURVED** screen **MOLDED** exactly to the picture tube curvature. It is Cut precisely to cover the exposed area of the picture tube. The fit is such that the static electricity is sufficient to keep it in place! We also include some invisible reusable tape for a more secure fastening.
- The filter material that we use is just right, not too dark nor too light. The result is a really eye pleasing display.
- We are so sure that you will never take your Green screen off that we offer an unconditional money-back guaranty: try our Green Screen for 14 days. If for any reason you are not delighted with it, return it for a prompt refund.
- A last word: We think that companies, like ours, who are selling mainly by mail should list their street address have a phone number (for questions and orders) accept CODs, not every one likes to send checks to a PO box offer the convenience of charging their purchase to major credit cards. How come we are the only green screen people doing it? Order your **ALPHA GREEN SCREEN** today. \$12.50

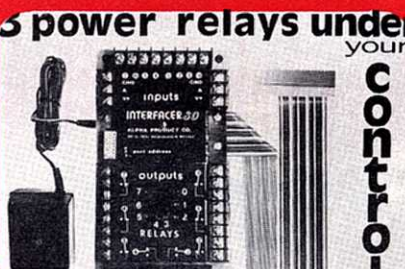


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Take the Next Step

There is an error in The Next Step (August 1983, p. 30). The USR call location in Program Listing 1 for tape systems is incorrect. Line 140 should read: 140 POKE 16526,0: POKE 16527,127.

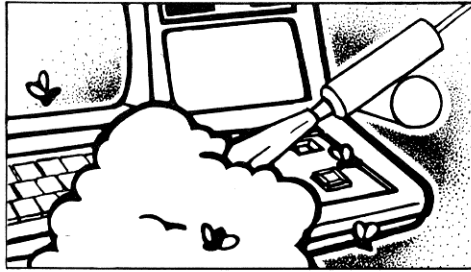
G.E. Casey
4020 Welmont Drive
Fayetteville, NC 28304

Assembling the Disassembler

David Cloutier's "Disassembler" article in C•Notes (September 1983, p. 283) contains several errors. Line 10530 doesn't work, but you can replace it with

```
S=(((((LM*16)+RM)*16)+L)*16+R:RETURN
```

Lines 160 and 170 are duplicated and have the wrong mnemonics (Cloutier attempted to use Z80 mnemonics, but the Model 100 has an 8085 processor).



Also, line 1780 RETURN is missing and needs to be added.

James Cole
515 Aspen St.
Vandenberg, CA 93437

Still Searching?

On page 110 of our December 1983 issue, we published an article by Joseph Trojak entitled "Finding the Search Solution." The article was missing Program Listing 12. You can find that listing on p. 213 of this issue.—Eds.

New Transactions

I've received a number of calls from readers who've had a difficult time loading the machine-language FRMS utility in my "Financial Transactions Recorder" article (September 1983, p. 140). The problem is easily solved. Under "Getting Started" on page 150, the Dump information should be DUMP FRMS (START = F000,END = F008).

Also, I've found one minor problem that may mystify other users. During printing to screen in Task 3, the program sets both the Dummy and Dual On modes. This reroutes text meant for the printer to the screen. When you end the program (Task 6), line 6020 turns the dual mode off but leaves the dummy mode active. Thus, anything intended for the printer isn't sent. This remains in effect until the program performs a System "Forms" or System "Forms N".

To correct this situation, modify line 6020 so that it reads:

```
...:SYSTEM"DUAL OFF":SYSTEM"FORMS N":PRINT@...
```

The newly added Forms N command deactivates the dummy mode and allows normal printer operation immediately after the program ends.

Jim Barbarello
R.D. #1, Box 241H
Tennent Road
Englishtown, NJ 07726

Don't Strip Yet!

The System Modifications box to Stephen Mills' "Strip Blackjack" (August 1983, p. 256) is partially incorrect. First, change line 130 (not line 30, as mentioned) in Program Listing 2 to:

```
130 FORX=Z! TOZ!+72:READY:POKEX,Y
:NEXTX:DEFUSR4=Z!:POKEZ!+7,
PEEK(Z+1):POKEZ!+8,PEEK(Z+2):
Z!=PEEK(VARPTR(Z7$)+1)+PEEK
(VARPTR(Z7$)+2)*256IFZ!>32767
THENZ!=Z!-65536
```

Then change line 1600 to:

```
1600 DEFUSR=Z!:G=USR(-399):
G=USR(ASC(Q$)AND15):RETURN
```

And finally, change line 1880 as suggested, but don't change line 1480.—Eds.

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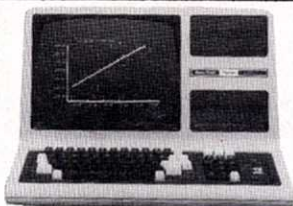
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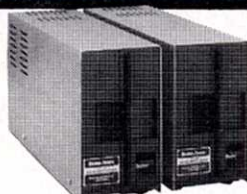
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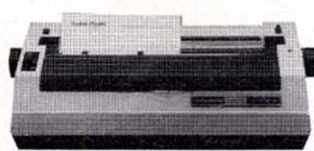
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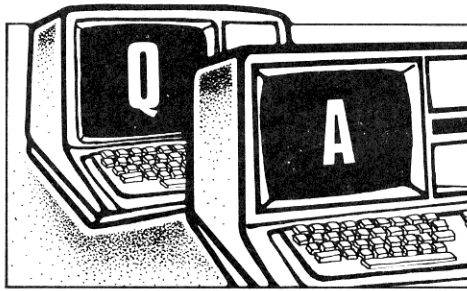
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I have a 48K dual-disk-drive Model I with a Centronics 700 printer. I use it extensively with VisiCalc, which worked fine until recently. One day after I booted up the program and was about to execute, the computer reset. The next attempt just dropped the program and for the next 15 minutes it refused to co-operate; then it booted and worked fine. Now every time I use the program I have the same problems making it work.

All my other programs, system and Basic, seem to work perfectly. And the program works just fine on a friend's system. Can you help?

Ted Waite
Idaho Falls, ID

It sounds like either your disk drive is starting to go, or something is wrong with your VisiCalc disk. It could be that your disk drive has drifted out of head alignment, or that the motor speed needs adjusting. VisiCalc is a large program and a slight variation in motor speed during the time it takes to load could cause the problem. Similarly, if the drive head is slightly off the track's center, it might be picking up noise from adjoining tracks (which would cause a bad load) or just not getting the data off the disk correctly.

A less likely source of your problem might be the VisiCalc disk, which could be flawed. Your friend's disk drive might be aligned differently or have slightly better electronics, and thus would not notice the problem with the disk.

First, try a different copy of VisiCalc. If just switching program copies solves the problem, then the problem was your program disk. If that doesn't work, have your disk drive checked out. That should solve your problem.

Prior to upgrading to 48K (two disk drives from 16K cassette), I purchased several programs from Radio Shack:

The problem solver

Series I Editor Assembler (26-2011), In-Memory Information (26-1508), and Scripsit (26-1505). My attempts to transfer these programs to disk have met with frustration and failure, even though I used the addresses given in the March 1982 issue of the TRS-80 Microcomputer Newsletter (except Scripsit, which is now on disk).

First, I really like the three programs and want to use them with my disk system. Second, while they are available for disk systems, I can't see the point of purchasing them just because they're on disk when the present ones work so well.

My question is: What are the correct addresses for transferring 26-2011 and 26-1508 to disk, and how do I get them to save and load data from disk instead of tape? Machine language is Greek to me, so any instructions will have to be step by step.

James Krywalski
Buffalo, NY

I can't help you with the addresses. As far as I know the ones given by the newsletter are correct. The second part, modifying the programs to use disk I/O, is almost impossible for anyone but a machine-language programmer. And even he or she would have problems. There's no simple procedure to change the programs to work with disk drives; a patch and additional coding are needed to implement such alterations.

You'll just have to put up with using the programs with cassette data until you can afford the disk versions. Sorry.

I'm currently designing an unusual software speed modification for the Model III. What I need is a great deal of technical information about the Model III Basic interpreter. Can you refer me to a public domain disassembler to use on the Model III ROMs? It has to be public domain because I can't afford to spend any money.

James Stallings
Rocky Mt., NC

There's no such thing as a free program. No matter where you get it, you'll have to pay something for the program, even if it's just for the cassette used to store the program. Anyway, 80 Micro has published the listing of a Basic program for disassembling the ROMs. The July 1981 issue has the program ("Enhance Your Level II Basic," p. 202) and the February 1982 issue contains a debug for the program (p. 28). If you're lucky, you might find a friend with copies of these issues to loan to you.

If you can manage to scrape together the money, the IJG book *Microsoft Model I Basic Decoded* has loads of information regarding the techniques used by Microsoft in their Basic. The Model III ROMs and the Model I ROMs are almost identical, differing only in the I/O routines and a few other enhancements. The IJG book also includes a complete, commented disassembly of the Model I ROMs. I think you'll learn more from an hour or so with this book than you can learn in several weeks on your own.

My new Smith-Corona TP-1 printer has a peculiarity in interfacing with Radio Shack's Model I Scripsit: It won't hear two carriage returns in a row. It isn't a malfunction of either the TP-1 or Scripsit.

This, of course, throws off line spacing and top and bottom margins. Does anyone have a fix for the TP-1 that defeats its Telex-style treatment of carriage returns? Or a patch for disk Scripsit? Or perhaps a series of TRSDOS

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SHADOW PRINT	<CLEAR> <S>	THIS SHADOW IS WILD HU?
1/2 LINEFEED F	<CLEAR> <F>	I LOVE SuperSCRIPT™
1/2 LINEFEED R	<CLEAR> <R>	Ca(OH) ₂ + H ₂ SO ₄ → CaSO ₄
PAUSE PRINTER	<CLEAR> <P>	I HATE PAUSING.
TOP OF FORM	<CLEAR> <T>	

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FEEDBACK LOOP

commands to get around this problem?

I'm also looking for a few lines of Assembly code for my Model I that will let me print the video display on my Epson MX-80 printer. I want to incorporate the routine into the freebie Term program Radio Shack gives you when you buy their RS-232 board for the Model I.

Robert Golstein
Tarzana, CA

Does anyone have a patch for Scripsit that will let it properly interface to the Smith-Corona TP-1?

The May 1980 issue of *80 Micro* has a screen print program invoked by pressing the I, J, and K keys simultaneously ("LPVIDEO," p. 136). It shouldn't be difficult to incorporate this program into your modified Term program. There're two Debug announcements for that program, one in the August 1980 issue (p. 16) and the other in the September 1980 issue (p. 14).

Actually, it shouldn't be that hard to write one yourself. All you have to do is change the keyboard scan routine to check for the special case of your screen print key, and a jump to a subroutine that scans the video from 3C00 hexadecimal (hex) to 3FFF hex and sends each character to the printer. For more information about the ROMs and useful routines you can access, get IJG's book *Microsoft Basic Decoded*.

Has anyone come up with a better method of mounting the RS-232 board in the Model I expansion interface (EI)? At least once a week (usually in the middle of a transmission) the board malfunctions and I have to take the EI apart and clean the RS-232 contacts. It'll work okay for a while, then I have to repeat the cleaning.

Tom Phoenix
Greensboro, NC

I have the same problem with my Model I. The problem is inadequate ventilation of the compartment containing the board. The board gets hot as you use it and linear expansion warps the board, pulling the connections apart and introducing noise. I've found that you can get pretty good contact for several weeks at a time by *not* tightening the two RS-232 screws all the way. When I start to have trouble with it, I just flex the board/EI cable a little and

it's good for another week or so.

A friend of mine, Dennis Kitsz, suggests making a small insulated metal bar that you can put over the RS-232 connector and hold in place by the two screws. The metal bar would prevent the board from flexing, solving the problem. You will, of course, still have to clean the tin/lead contacts on the EI and RS-232 board connectors every once in a while, but at least it won't be every week.

Another solution was published in the May 1981 issue of *80 Micro*: hardwire the board to the EI, permanently solving the problems of poor connections and board flexing ("Hardwire the TLS-232," p. 202). Unfortunately, you have to be pretty good at soldering to accomplish this modification. It also has the implication that if you ever have trouble with any of the components on the RS-232, you can't just remove the board and replace it with another.

I have a Model III and recently bought some NEC memory chips in Japan to increase my system to 48K. When I powered up my computer, all I got was 48,082K, not 49,152 (1024×48). I took out the extra chips and checked memory, which indicated 15K plus. Is something wrong with my computer?

Also, when I type in NEW and then PRINTMEM, I don't get back what I started with. After several Loads, Runs, and News, I find that I've exhausted memory and get an OM error. Why?

Lance Cresswell
San Francisco, CA

There's nothing wrong with your computer. Basic grabs some of the first bank of RAM for it's own use, about 1,000 bytes total (the Model I only takes about 800 bytes). The computer subtracts these bytes from your available RAM, hence the difference between your computed memory and the actual amount left.

Your other problem is tied to the Clear command, used to reserve memory for string variable data. Programs frequently use this command to prevent OS errors from crashing the program, especially in programs with lots of string data, such as mailing list or data base programs. The amount of RAM reserved by Clear is unchanged by the New command. CLEAR 5000 removes 5,000 bytes from the number returned

by the PRINTMEM command. The only way to free the memory is to issue a new Clear command, specifying a lower number. The computer powers up with 50 bytes reserved by Clear. Try issuing a CLEAR 50 command after the New command, and then PRINTMEM. You should always see the same number returned.

I own a 48K Model III single-drive system with NEWDOS80 2.0 and Model III Scripsit 3.2. I'd like to be able to use a do- or chain file on Scripsit that will automatically print a preselected letter or other similar task. I understand Scripsit uses its own keyboard driver, so it doesn't recognize characters stored in a do-file. I've tried to reroute Scripsit's keyboard driver to point to the ROM driver, but my machine-language skills are limited. Is this the correct solution?

I think this automation of Scripsit could open up a new world of data base and word-processor interfacing: run a chain file to load a selected letter, say, depending on a code in the data base, and print it while you sit back and watch it work.

Mark Read
Artarmon, Australia

Sounds like an interesting idea. One of the problems with it, besides the keyboard driver routine, is that you have to make sure to reserve memory in high RAM for the do-file and prevent Scripsit from using that area for its own purposes. I believe that NEWDOS80 uses its own keyboard driver routine, so check your technical documentation for information about it. Then route the Scripsit keyboard driver to the NEWDOS driver. That should get you on your way.

Has anyone else tried mating the do-file technique with Scripsit?

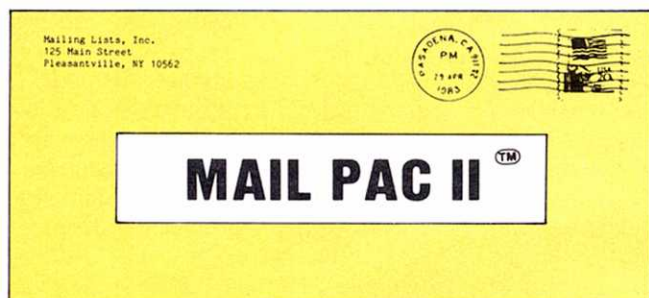
I own a 48K Model I that I recently updated with Radio Shack's Double-Density Board. Being clever and wanting to increase on-line storage, I also added a double-sided drive as my second drive. I now realize that TRSDOS 2.77DD doesn't support the second side. How can I access the second side? Can I patch TRSDOS 2.77D to do this? Is a hardware modification needed?

William Brown
Reistertown, MD

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I haven't heard of anyone who's patched TRSDOS 2.77DD for double-sided drives. Can anyone help?

Assuming that there's no patch forthcoming, your best bet would be to buy a new DOS. MULTIDOS (Cosmopolitan Electronics Corp., 5700 Plymouth Road, Ann Arbor, MI 48105, 313-668-6660, \$99.95), DOSPLUS (Micro-Systems Software Inc., 4301-18 Oak Circle, Boca Raton, FL 33431, 305-983-3390, \$149.95), NEWDOS80 (Apparat Inc., 4401 S. Tamarac Parkway, Denver, CO 80237, 303-741-1778, \$149), and LDOS (Logical Systems Inc., 8970 N. 55th, P.O. Box 23956, Milwaukee, WI 53223, 414-355-5454, \$129) all support double-sided disk drives and work with Radio Shack's Double-Density Board.

You don't need to make any hardware modifications.

I'm a serviceman stationed overseas. I have a Model III with 48K RAM and no disk drives. The shipping over here has caused a problem: After warming up for a few minutes, the characters in the first row seem to condense and become unreadable. I'd like to repair the problem myself, but don't know how.

Monseratte Pagan
San Francisco, CA

The problem is shock damage to the yoke assembly. Open up the case and discharge the video tube (or let it sit for a day), then grab the yoke and gently straighten it out. You may have to try several times before you get it right. If this doesn't work, have a TV technician take a look at the video electronics. You may have to replace the yoke.

If you don't understand what I mean in the above paragraph, then you probably don't know TV electronics well enough to attempt the repair yourself. If so, take it to a repair technician.

I have a Model I, Level II 16K cassette-based system with Exatron Stringy Floppy drive. I have many games with sound, but I don't like having to plug in an audio amplifier to the cassette port, and then hunting up batteries. I'd like to incorporate an amplifier circuit in my computer, but I need a stabilized voltage between 4 and 12 volts and I don't know where to find it inside the computer within easy reach to the cassette port.

In the June 1983 Feedback column you told someone how to install extra memory in his Model III (p. 350). Can I do this with my Model I?

Finally, sometimes, when I listen to my tape recorder by removing the ear plug, the sound is weak and I can hear the rolling of the motor from the speaker. If I remove the cassette and place my hand near the tape head, the rolling becomes louder. Is the head magnetized?

David Raymond
Brossard, Canada

There are two ways to tackle the audio amplifier problem. One is to mount the unit inside the computer (above the three-ROM satellite board, under the Radio Shack logo block on the right side of the keyboard), and the other is to run a power line from the internal power supply through the case, which you could then use to drive the amplifier.

The first solution works; I did it to my computer. Find a small audio amplifier board powered by 12 volts or less (5 volts is preferred). Attach it either to the computer circuit board with non-conducting tape, or to the computer case itself. Cut a slot in the case and orient the unit so that you can reach the amplifier's off/volume switch, which should stick out some. You may have to remove the amplifier from its case to do this right. Experiment with several positions to find the best one before you go chopping up the computer case.

Now solder the positive lead from the amplifier to one of the power traces on the computer's circuit board (the traces are facing up, the components are on the bottom, so the traces are easy to get to). Next, solder the black ground wire to the computer's ground trace. And finally, locate the cassette socket, identify the two leads that go to your cassette recorder (don't let the remote plug line confuse you), and then solder the two input wires of the amplifier to the cassette circuit.

This should put you in business, with an audio amplifier neatly hidden away inside your computer case, and an easily accessible volume knob for controlling it.

The other method is to find the amplifier you want to use, and determine whether it's 12V or 5V. Inside the computer, locate the appropriate power supply circuitry and then solder the two power supply leads to the positive and negative lines. Make sure you orient the

wires correctly for plugging into your amplifier. If the amplifier is designed for using non-battery power (as in an ac adapter), this orientation is crucial. Usually, but not always, the center of the plug is positive and the perimeter is negative. Goofing up here could easily damage your amplifier, computer, or both. Once you've soldered the two wires in place, run them over to the cassette port, cut a small hole, and run them outside the computer. Solder the wires to a plug that will fit your amplifier, and you're all set.

Both of these methods require that you get the *Model I Technical Manual* (Radio Shack part number 26-2103, \$9.95), which includes all the circuit diagrams showing you parts layout and circuit locations.

Adding extra memory to the Model I requires either buying an expansion interface that has the extra sockets for adding the memory, or modifying the CPU circuit board to make room for the extra chips. Microhatch (P.O. Box 501, DeWitt, NY 13214, 315-446-8031, \$169) sells a kit called BIG MEM that replaces the 16K RAM chips you currently have in your keyboard unit with new 64K RAM chips, giving you a 48K system with the Level II ROM. You can disable the ROM if you want, and have a 64K RAM Z80 computer for CP/M. Holmes Engineering (5175 Green Pine Drive, Murray, UT 84107, 801-261-5652, \$139.50) has a similar unit, the IM-2, with 32K RAM that brings your total memory to 48K RAM.

Several companies sell expansion interfaces for the Model I computer, including LNW Research Corp. (2620 Walnut, Tustin, CA 92680, 714-641-8850, \$399, with disk controller, 32K RAM, and RS-232 unit included), Micro-Design (6301 Manchaca Road, Suite B, Austin, TX 78745, 800-531-5002, \$469.95, with modem, disk controller, and 32K RAM included), and Holmes Engineering (see above for address, \$150, memory not included, call for details). Holmes Engineering also has an expansion box for adding other peripherals like a disk controller, RS-232, and so forth.

It sure sounds as if your tape recorder's head is magnetized. I suggest you get a tape head cleaner and demagnetizer and use them on your unit. It should clear up the problem. If it doesn't, your tape recorder probably needs replacement.

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2 ANNU1	Annuity computation program	60 COMBAL	True rate on loan with compensating bal. required
3 DATE	Time between dates	61 DISCBAL	True rate on discounted loan
4 DAYYEAR	Day of year a particular date falls on	62 MERGAL	Merger analysis computations
5 LEASEINT	Interest rate on lease	63 FINRAT	Financial ratios for a firm
6 BREAKVEN	Breakeven analysis	64 NPV	Net present value of project
7 DEPRSL	Straightline depreciation	65 PRINDLAS	Laspeyres price index
8 DEPRSY	Sum of the digits depreciation	66 PRINDPA	Paasche price index
9 DEPRDB	Declining balance depreciation	67 SEASIND	Constructs seasonal quantity indices for company
10 DEPRDDB	Double declining balance depreciation	68 TIMETR	Time series analysis linear trend
11 TAXDEP	Cash flow vs. depreciation tables	69 TIMEMOV	Time series analysis moving average trend
12 CHECK2	Prints NEBS checks along with daily register	70 FUPRINF	Future price estimation with inflation
13 CHECKBK1	Checkbook maintenance program	71 MAILPAC	Mailing list system
14 MORTGAGE/A	Mortgage amortization table	72 LETWRT	Letter writing system-links with MAILPAC
15 MULTMON	Computes time needed for money to double, triple, etc.	73 SORT3	Sorts list of names
16 SALVAGE	Determines salvage value of an investment	74 LABEL1	Shipping label maker
17 RRVARIN	Rate of return on investment with variable inflows	75 LABEL2	Name label maker
18 RRCONST	Rate of return on investment with constant inflows	76 BUSBUD	DOVE business bookkeeping system
19 EFFECT	Effective interest rate of a loan	77 TIMECLK	Computes weeks total hours from timeclock info.
20 FVAL	Future value of an investment (compound interest)	78 ACCTPAY	In memory accounts payable system-storage permitted
21 PVAL	Present value of a future amount	79 INVOICE	Generate invoice on screen and print on printer
22 LOANPAY	Amount of payment on a loan	80 INVENT2	In memory inventory control system
23 REGWITH	Equal withdrawals from investment to leave 0 over	81 TELDIR	Computerized telephone directory
24 SIMPDISK	Simple discount analysis	82 TIMUSAN	Time use analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.	83 ASSIGN	Use of assignment algorithm for optimal job assign.
26 ANNUDEF	Present value of deferred annuities	84 ACCTREC	In memory accounts receivable system-storage ok
27 MARKUP	% Markup analysis for items	85 TERMSPAY	Compares 3 methods of repayment of loans
28 SINKFUND	Sinking fund amortization program	86 PAYNET	Computes gross pay required for given net
29 BONDVAL	Value of a bond	87 SELLPR	Computes selling price for given after tax amount
30 DEPLETE	Depletion analysis	88 ARBCOMP	Arbitrage computations
31 BLACKSH	Black Scholes options analysis	89 DEPRSF	Sinking fund depreciation
32 STOCVAL1	Expected return on stock via discounts dividends	90 UPSZONE	Finds UPS zones from zip code
33 WARVAL	Value of a warrant	91 ENVELOPE	Types envelope including return address
34 BONDVAL2	Value of a bond	92 AUTOEXP	Automobile expense analysis
35 EPSEST	Estimate of future earnings per share for company	93 INSFILE	Insurance policy file
36 BETAALPH	Computes alpha and beta variables for stock	94 PAYROLL2	In memory payroll system
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold	95 DILANAL	Dilution analysis
38 OPTWRITE	Option writing computations	96 LOANAFD	Loan amount a borrower can afford
39 RTVAL	Value of a right	97 RENTPRCH	Purchase price for rental property
40 EXPVAL	Expected value analysis	98 SALELEAS	Sale-leaseback analysis
41 BAYES	Bayesian decisions	99 RRCONVBD	Investor's rate of return on convertible bond
42 VALPRINF	Value of perfect information	100 PORTVAL9	Stock market portfolio storage-valuation program
43 VALADINF	Value of additional information		
44 UTILITY	Derives utility function		
45 SIMPLEX	Linear programming solution by simplex method		
46 TRANS	Transportation method for linear programming		
47 EOQ	Economic order quantity inventory model		
48 QJUE1	Single server queueing (waiting line) model		
49 CVP	Cost-volume-profit analysis		
50 CONDPROF	Conditional profit tables		
51 OPTLOSS	Opportunity loss tables		
52 FQOQ	Fixed quantity economic order quantity model		
53 FQEOUSH	As above but with shortages permitted		
54 FQEOQPB	As above but with quantity price breaks		
55 QJUECB	Cost-benefit waiting line analysis		
56 NCFANAL	Net cash-flow analysis for simple investment		
57 PROFIND	Profitability index of a project		
58 CAP1	Cap. Asset Pr. Model analysis of project		

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Regarding unexpected reboots and the Gold-Plug 80 connectors, you're ignoring one 34-pin edge connector: the disk drive! My Tandon drives each use a cable to connect two printed circuit boards inside the drive. The data lines cross the rear board to get to the controller board. The same solder-coated edge contacts are used on the controller board as at the back of the drive.

Since I couldn't install a Gold-Plug 80 inside the disk drive, I had to carefully solder 13 wires between the two boards. These 13 connections are accessible after removing the drive cover (the inside connections on the other side of the circuit board are inaccessible, but all are ground lines, so it seems safe to ignore them). Each of the 13 lines on the controller board goes to plated-through connections near the edge, making it convenient to insert each wire into the hole for soldering. On the rear board, you can tack-solder each wire to the connector pins. You need small-diameter wire and a pointed soldering iron (low-wattage).

Since installing these new connectors in my drives, in addition to Gold-Plug 80s on the computer system, I've had no further unexpected hardware reboots. (I also replaced the Radio Shack cables with new gold-plated ones from Alpha Products, Woodhaven, NY 11421).

John Huffman
Winston-Salem, NC

Thanks for the information. Fortunately, not all disk drives use two boards inside, so not all of us have to go to the trouble you did to solve the problem. For the rest of us, if you have problems with disk reboots and you've already installed Gold-Plug 80 connectors, check your disk drives—they may need a Gold-Plug too. I'd be very careful about ignoring those ground lines, however; they're needed to help maintain data integrity by screening out electrical noise and RFI.

I have two problems with my 48K Model I which came to light recently. The first, as a result of exploring Delmer Hinrichs' "3-D Printer Graphics" (May 1983, p. 236) while scanning $\text{COS}(X)/(X)$ and $\text{SIN}(X)/(X)$, where X varied from zero to 6PI by steps of $.1\text{PI}$, I found that the $.1$ factor changed in an unusual fashion. I had written X as $A*\text{PI}$ where A varied in steps of $.1$.

I'm at a loss to explain this or to dream up a fix. I previously had this trouble with a step of one, where the step was some consistent factor less than one. I traced this to a corroded connection leading to the expansion interface. I now have Gold-Plug 80s throughout. The present problem lies in the keyboard unit since I get the same results with the EI disconnected. Any suggestions or remedies?

Next, according to several sources I should be able to key in 256 bytes per input line, but my keyboard stops at 240. What's up?

Thomas Rogers
Morro Bay, CA

The problem is with the method Microsoft uses to manipulate numbers. I first ran into this problem on an IBM 360 computer in 1969, and then again on a CDC6400 in 1971, so the problem isn't peculiar to just the TRS-80 or Microsoft. The difficulty lies in that $.1$ is not a precisely defined number in binary math; $.1$ is to binary math like $1/3$ is to decimal math. Repetitious calculations slowly build up to a large, noticeable error.

You've stumbled into that strange area of computation called numerical analysis, where the method used to compute the formula can actually affect the final answer. Since you can't change the method used by the ROM for math manipulations, you'll have to use a kludge to get the right answer (as they say in college physics, if the data doesn't fit the curve, fake it).

The only solution is to avoid using step factors of less than 1. Make the step 1, and divide X by 10 to get the proper step for your mathematical formula. This problem, errors with numbers less than 1, is frustrating when you're working with finances. I've had several questions regarding errors in dollars and cents and how to get rid of the trailing digits.

Your sources of information don't know what they're talking about. The Level II ROMs limit keyboard input to 240 characters, although you can make Z80 instruction jumps of 256 bytes. Level II ROMs use the bytes between 256 and 240 to tell the operating system the beginning and ending addresses of the character string, with a zero byte between this information and the string, a

carriage return (at the end of the string), and a zero byte to separate it from the next string in memory. Also, some of those bytes are used to store the variable name (two characters plus type declaration) and a separator byte.

Some of the DOSes on the market have modified routines that let you key in 256 bytes, but the Level II ROMs won't.

In Basic, the extra spaces are used by the program line number, length of the line, address of the next line number, a zero separator between the beginning of the line itself, a carriage return at the end of the line and another zero byte separator (remember, the line editor has a total length of 256 bytes, which have to contain all that information).

In summary, the problems you've encountered are ROM related, and can't really be changed except by substituting the errant routines with new machine-language code that does the job correctly.

I'm using the EDTASM package in NEWDOS 2.1, which isn't supported by Apparat. I've found that when I use the A command to produce object code, the switches for printout, error catching, and so forth, don't work. Since the package is a modification of the original tape EDTASM, Apparat refers the user to the Radio Shack manual, giving only the specific changes made by Apparat.

The syntax for A is listed by Radio Shack as A (filespec) (switch). The NEWDOS 2.1 EDTASM seems only to accept A, then it prompts for tape or disk output. Does an undocumented syntax change exist here? If not, is there a fix? I'm only a beginner and I don't want to invest in a new editor/assembler at this time.

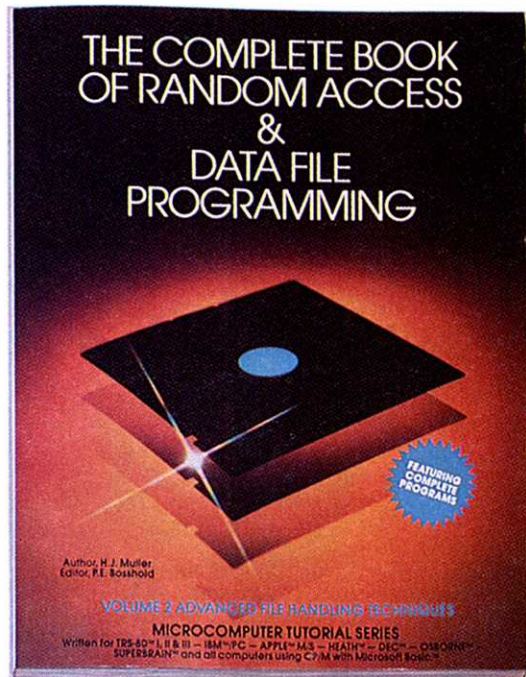
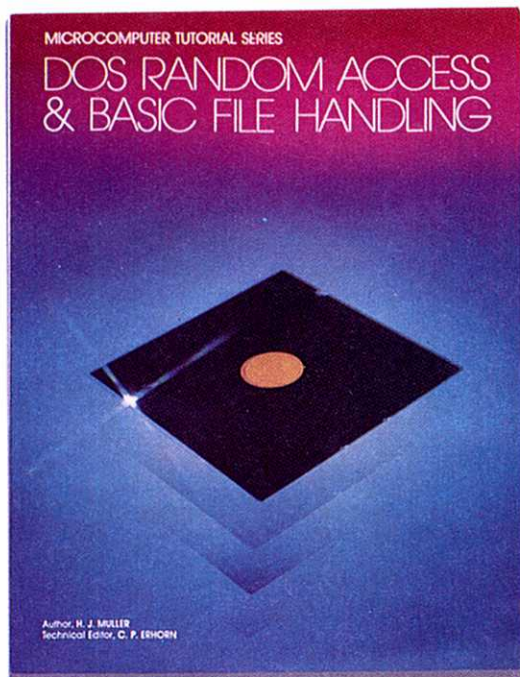
For those using Newsprint 7.0 and LDOS 513, you have to modify Start-up/MIN for LDOS. Newsprint uses its own keyboard driver and, when you use the Clear/Break command sequence (which normally splits a Newsprint line in two), Newsprint and LDOS each read the break key once and return you to BASIC READY. To make the Clear/Break sequence work properly, include the following command in Start-up/MIN:

SYSTEM (BREAK = OFF)

A tip for LDOS users who have print-

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ers that accept single codes instead of requiring escape codes first: use the System (Graphic) command. You can then construct a filter, using XLATE/FLT, that will let you use some of the TRS-80's special characters and graphics symbols, but which most printers can't produce. I use graphics characters generated by two LDOS keystrokes to output special printer codes within VisiCalc, for example.

Mark Fagan
Toronto, Canada

The problem is the way you're specifying the switches. I've used NEWDOS 2.1 with the modified EDTASM for several years without experiencing any problems with the switches. You should type:

A filespec,switch,switch

Remember, the switches MUST be in uppercase. The blank space is mandatory. I know Apparat EDTASM works, just experiment a little.

Thanks for the tips.

I have a Model I with Holmes' 48K internal memory and an Exatron Stringy Floppy. I'm thinking of getting disk drives to take advantage of software for 32K and 48K.

What effect will my Holmes board have if it's operating with an MDX-2, Disk 80, or LNW Expansion Interface?

Ronald Mattson
Brockville, Canada

The presence of the Holmes board shouldn't make any difference to the expansion interfaces, as long as they don't include memory of their own. If they do include memory, then you'll have a conflict between the information in the Holmes IM memory and the memory in the EI. The end result will probably be blown memory or memory driver chips.

I'm an owner of a Model III, complete with a VR Data disk controller and two VR Data disk drives. After receiving a notification of reassignment to Europe, I asked some people at Radio Shack about making my computer work with 50-cycle current. Here are the answers:

● "There's no way to do it, you'll have to buy another Model III in Europe."

● "You don't need to do anything as long as you use a stepdown transformer; the dc drives won't notice anything."

● "All you need is a transformer to convert from 220V/50 Hz to 110V/60 Hz."

Three months later, here I sit listening to my drive motors turning themselves off and on, over and over, at about three-second intervals. Everything works fine, but I can't get used to the idea of my drives tearing themselves up like this. Can you help?

E.F.
Augsburg, Germany

"You've stumbled into that strange area of computation called numerical analysis."

As I recall, Model III TRSDOS comes with a utility called HZ50/CMD that's supposed to configure the Model III drives to work correctly with 110V/50 Hz current. Contact your closest Radio Shack dealer about getting a copy of this utility for your system.

My computer is a Model I Level II with 32K RAM LNW interface, one Tandon drive, and four BASF 6106 disk drives. At one time the BASF drives worked, one at a time, but I've changed the programming jumpers so much that they no longer work.

I can use the Tandon drive alone, but that's too restrictive. I want to use the Tandon with the BASF, or the BASF by themselves. I noticed that the Radio Shack cable has teeth pulled so that the position of the drive on the cable defines the drive number, but when I bought one it didn't help me.

Alfred Bowman
Gig Harbor, WA

The first thing you should do is buy the technical manual for the BASF 6106

drives. Software Support (One Edgel Road, Framingham, MA 01701, 617-872-9090, \$14.95) has copies of the manual. You can also get the manual from BASF Corporation (Computer Hardware Sales, Crosby Drive, Bedford, MA 01730, 617-271-4168), but I don't know the price.

Now, for your problem: You can only hook up the BASF drives with a maximum of three drives on the system. The BASF drives are jumpered inside the case as either drives 1, 2, or 3. If you use the Radio Shack cable, then you must make sure that the drive jumper setting matches the pin select of the cable (first cable position drive must be jumpered as drive 1, position 2, jumpered as drive 2, etc.).

The Radio Shack disk drive system is designed as a radial chain, with each drive accessed separately. I'll tell you how to set up a BASF drive as drive 3 (which is where I have my BASF drive in my Model I system). Find jumper matrix JJ1 (a 6-pin jumper block). If pins 1 and 2 (bottom set) are connected, the drive is set as drive 1. If pins 3 and 4 (middle set) are jumpered together, it's drive 2. The top two pins set it up as drive 3.

Find jumper matrix JJ2 (a 14-pin jumper block beside JJ1). Jumper pins 3 and 4, and 9 and 10 together. This sets the head load option to radial. Jumper pins 5 and 6 together for radial select option.

Find the two 14-pin jumper blocks at the front of the drive. The one closest to the drive door is JJ4. Jumper pins 5 and 6 of JJ3, and 3 and 4 of JJ4 together to set the write protect of your disk to mean that a covered notch protects the disk. Jumper pins 5 and 6 of JJ4 together so that the LED on the door will light when the drive door is locked and the drive is spinning at speed. Jumper JJ3 pins 13 and 14 together for automatic head load.

These options should get your disk drives in operation until you get your own drive manual and can select the options you want.

I have a Model III dual-disk micro-computer. My problem is that I can't assemble my 185-record 12-extent source-code program with Radio Shack's Series I Editor/Assembler (only 35 bytes free, I get Symbol Table overflow).

I'm willing to spend up to \$200 for a one-time solution. I've heard that Ra-

FEEDBACK LOOP

dio Shack's "Edit" assembler will fit my needs, but none of the local Radio Shacks know what it is. Can you help?

Vik Gavande
Austin, TX

You want MZAL, by Computer Applications Unlimited (P.O. Box 214, Dept FSBE, Rye, NY 10580, 914-937-6286, \$149). This system of programs uses a linking loader to independently assemble written source-code modules into one program. The limit is 30,000 bytes for a symbol table, or your available disk space. For more information on this system, read the review in the October 1982 issue of *80 Micro* (p. 160).

UPDATE

In the October 1983 Feedback I said that the Alpha-Products joystick used the 5-volt line of the TRS-80 for a power source. Well, one of their technicians called me and told me that their unit doesn't even have a pin connection to that line, so it couldn't be using that line for a power source. Given that fact, I can't see any reason why the joystick would malfunction in the manner described by A.L.H., of Raritan, NJ (October 1983, p. 336). Sorry about that. ■

Terry Kepner is a freelance writer and programmer, and the vice president of Interpro. He's been writing about microcomputers since 1979.

Frequently Needed Numbers

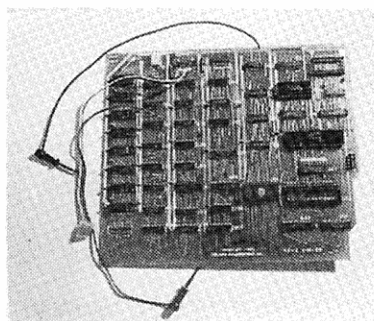
Radio Shack, National Parts Division, 900 East Northside Drive, Fort Worth, TX 76102, 817-870-5662. M/C and Visa accepted, each order has \$1.50 handling charge.

IJG Inc., 1260 West Foothill Blvd., Upland, CA 91786, 714-946-5805. Publisher of *TRS-80 Disk and Other Mysteries* (\$22.50), *Microsoft Basic Decoded and Other Mysteries* (\$29.95), *The Custom TRS-80 and Other Mysteries* (\$29.95), *Basic Faster and Better* (\$29.95), *Machine-language Disk I/O and Other Mysteries* (\$29.95), *TRSDOS 2.3 Decoded and Other Mysteries (Model I)* (\$29.95), *How to do it on the TRS-80* (\$29.95), and the *Electric Pencil Word Processor* (\$89.95).

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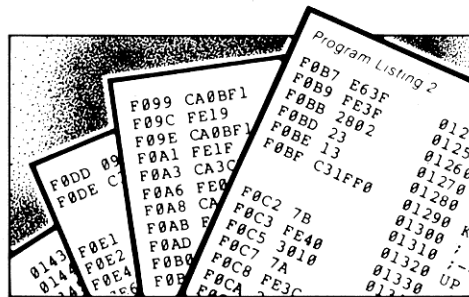
Wait! Before you read this column, follow these instructions exactly:

1. If you are using a disk system, specify zero files when you enter Basic.
2. Type Program Listing 1 into your Model I, Model III, or Model 4 (in Model III or ROM mode).
3. Make sure you've entered everything exactly as it appears.
4. Save the program to tape or disk.
5. After you save the program, run it.

Do you understand what happened? Should you list it again to take a better look? I'll leave what, why, and how in the air for a moment; I'll discuss this programming technique later in the column.

Strings on the Screen

I'm devoting this month's column to answering the mail and presenting some short, useful readers' techniques, as well as a few of my own.



A programming potpourri

First come requests from Model I/III and Model 4 programmers for ways of reproducing material that appears on the screen. Some of the requests have been spurred by a feature which I be-

lieve is unique to LDOS (Model 4's TRSDOS 6.0 is a licensed version of LDOS 6.0). The techniques are the same no matter what material you want to get from the screen.

When you boot an LDOS system disk, you are asked to enter the date in the standard MM/DD/YY format. As soon as you press the enter key, the computer processes the date and displays it in the more normal day, month date, year format. For example, if you enter 12/31/83, LDOS translates it to Sat, Dec 31, 1983. Every time you use LDOS's Date command, the date appears in the expanded format. It's a nice, though not critical, feature of LDOS.

Problems arise when you go to Disk Basic. If you enter the command PRINT DATE\$, the familiar 12/31/83 returns. Since the day/date algorithm exists as a DOS library command, you can always use CMD "DATE" on the Model I/III or SYSTEM "DATE" on the Model 4 to display the expanded form. But if your program takes action based on the day of the week, or needs to use the expanded form in a printed report, you must somehow capture it in a string. The problem is how to do that.

To further define the problem, notice that the expanded form of the date always takes exactly 17 bytes. Also, assume that you've cleared the screen just before you issued the CMD or SYSTEM command. Therefore, you need a way to put the first 17 bytes on the screen into a string that you can further manipulate or use in a program.

The solutions for the Model I/III and Model 4 are completely different because the Model 4, running under TRSDOS 6.0 and compatible systems, does not use a normal memory-mapped video display (nor a memory-mapped keyboard). It has a special 2K of static RAM for the screen, but that memory isn't part of the 64K RAM available to the Z80 processor.

In simpler terms, you can't POKE characters to the screen or PEEK character values from the screen. (Actually, that's not quite true, but a Basic program can only directly address screen memory by some unusual bank-switching that may destroy values essential to

```
10 CLS: DEFINT A,I: DIM A,I
20 FOR I=16635 TO 16638: READ A: POKE I,A: NEXT I
30 DIM A(69): FOR I=0 TO 67: READ A(I): NEXT I
40 POKE 16548,0: POKE 16549,111: POKE 16633,139
50 POKE 16634,111: POKE 16635,139: POKE 16634,111
60 CLS: LIST
70 DATA 248, 110, 248, 110
80 DATA 28445, 10, 8224, 8224, 8224, 17730, 21587
90 DATA 22304, 21321, 17736, 8275, 8321, 18516, 8261
100 DATA 15872, 5231, 8192, 18464, 20545, 18768, 21317
110 DATA 8276, 17999, 18464, 19535, 17481, 22849, 21280
120 DATA 16709, -24237, 83, 28499, 30, 8224, 8224, 8224
130 DATA 8224, 8224, 8224, 21062, 19791, 28160, 10351, 8192
140 DATA 8224, 8224, 8224, 16712, 17490, 20041, 16928, 20306
150 DATA 18516, 21061, 83, 28553, 50, 8224, 8224, 8224, 8736
160 DATA 18516, 8261, 17742, 21592, 21280, 17748, 8784
```

Program Listing 1. Demonstration program.

```
1 REM *****
2 REM
3 REM Program for LDOS 5.1.x to capture
4 REM expanded DATE form in Basic
5 REM string DA$ -- same technique can
6 REM be used to capture anything on the
7 REM screen in a Basic string.
8 REM
9 REM *****
10 CLS: CMD "DATE"
20 DU$="X"
30 POKE VARPTR(DU$),17
40 POKE VARPTR(DU$)+1,0
50 POKE VARPTR(DU$)+2,60
60 DA$=DU$
70 PRINT DA$
80 END
```

Program Listing 2. Model I/III solution for capturing the expanded date form.

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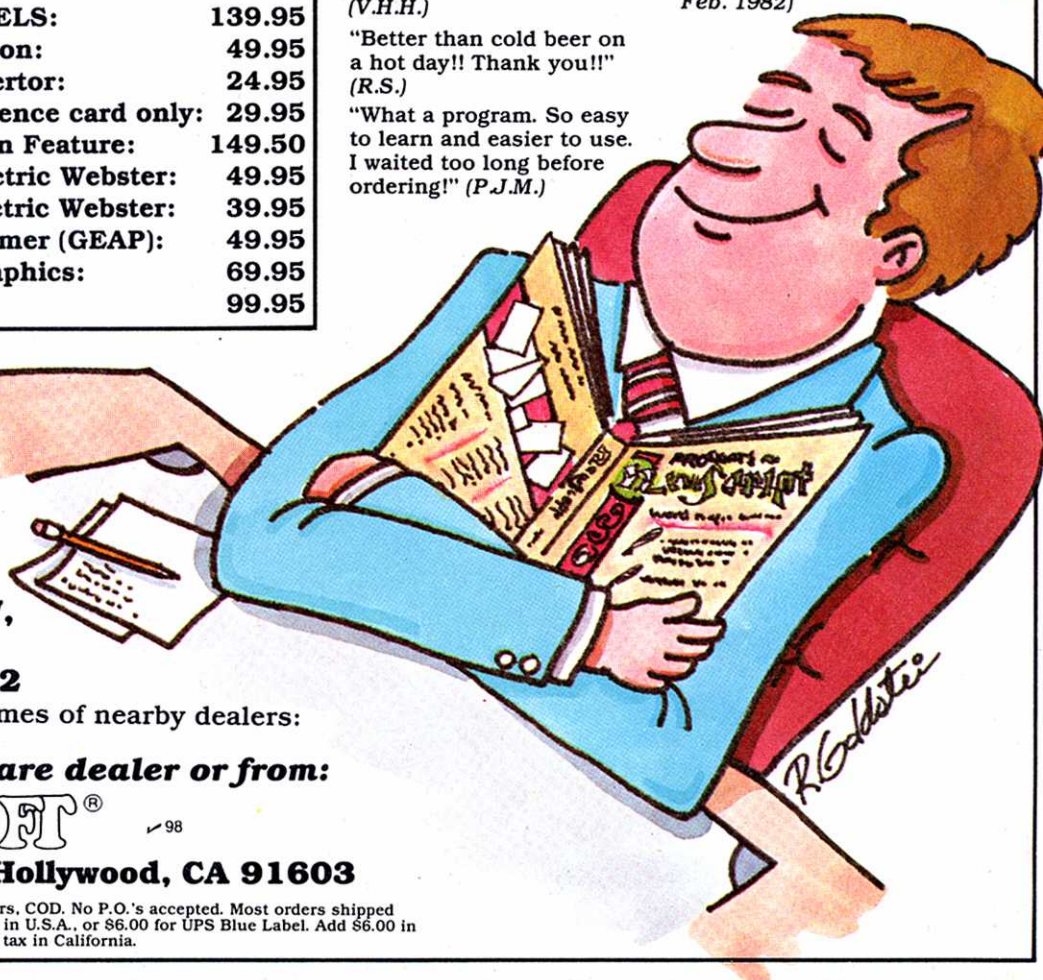
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THE NEXT STEP

the system—not a recommended technique).

I'll start with the Model I/III solution. Notice that Program Listing 2 is written entirely in Basic, without any machine-language subroutines. Until you're familiar with the technique,

however, it may be a little confusing. The program creates a dummy string, DU\$, expands it to 17 bytes, and points it to the beginning of the screen where the program displays the date. Then it transfers those 17 bytes to DA\$, which it prints to verify that everything is in

order.

You may remember from my last two columns that Basic uses 6 bytes in low memory to store information about a string variable. The actual characters are usually stored in high memory. The 6 bytes for DU\$ would be:

03 hex	string type code
55 hex	"U" (2nd letter of name)
44 hex	"D" (1st letter of name)
len	length of string
lsb	Least significant byte (LSB) of string address
msb	Most significant byte (MSB) of string address

The value returned by VARPTR(DU\$) is the address of the fourth of these 6 bytes, "len."

Line 10 in the program clears the screen and prints the expanded date in the upper left corner. Line 20 creates the dummy string, DU\$. The fun begins in line 30, where, by POKEing 17 into the fourth position in the variable entry, DU\$ automatically becomes 17 bytes long.

In lines 40 and 50, change the address of DU\$ so its information block in the simple variable table indicates that it contains 17 bytes beginning at 3C00 hexadecimal (hex), the beginning of screen memory. Then in line 60, DU\$ is copied to DA\$. This is a necessary last step, because DU\$ points to or contains the first 17 bytes on the screen.

As soon as the screen changes, DU\$'s contents change. Copying DU\$ to DA\$ transfers the present contents of DU\$ (the expanded date) to a safe place in high memory.

DU\$ points to the top of screen memory until you use it on the left side of the equal sign in a LET statement. Then the program points it back to the more normal high memory. You can use strings pointed to the screen to produce some amazing graphics written entirely in Basic. For examples, see my "Super Fast Graphics in Basic" in Volume 9 of the *Encyclopedia for the TRS-80* (Wayne Green Inc., 1982).

The Model 4 solution is slightly more complicated because it combines a Basic program with a machine-language subroutine. The Basic program is shown in Program Listing 3, the machine-language source code in Program Listing 4.

This program operates by creating a string, DAY\$, of the required length.

```

10 *****
20 '
30 ' Model 4 Program to capture TRSDOS's DATE
40 ' display in string DAY$.
50 '
60 'This program may be chained to any
70 ' program that wishes to display day/date
80 '
90 *****
100 '
110 CLS: SYSTEM "DATE"
120 X=1: DAY$=SPACE$(17)
130 WHILE X <> 0
140 READ X: CODE$ = CODE$ + CHR$(X)
150 WEND
160 Q = PEEK(VARPTR(DAY$)+1) + PEEK(VARPTR(DAY$)+2)*256
170 IF Q > 32767 THEN Q = Q - 65536!
180 Q% = Q
190 R = PEEK(VARPTR(CODE$)+1) + PEEK(VARPTR(CODE$)+2)*256
200 CALL R (Q%)
210 PRINT DAY$
220 COMMON DAY$
230 END
240 DATA 94, 35, 86, 175, 103, 111, 6, 17, 197, 213, 62
250 DATA 15, 6, 1, 239, 209, 193, 32, 5, 18, 35, 19, 16
260 DATA 240, 201, 0

```

Program Listing 3. Model 4 solution for capturing TRSDOS's date display.

```

00100 ;SUBROUTINE FOR MODEL 4, TRSDOS (LDOS) 6.0
00110 ; WILL READ THE RESULTS OF SYSTEM "DATE"
00120 ; FROM THE SCREEN, AND SAVE THE PRESENT
00130 ; DAY/DATE IN DAY$ -- MUST BE PART OF
00140 ; A BASIC PROGRAM
00150 ;
000F 00160 VDCCTL EQU 15 ;VIDEO SVC #
00170 ;
8000 00180 ORG 8000H ;FOR ASSEMBLY ONLY
00190 ;
8000 5E 00200 LD E,(HL) ;GET LSB OF DAY$ ADDR
8001 23 00210 INC HL ;BUMP POINTER
8002 56 00220 LD D,(HL) ;GET MSB OF DAY$ ADDR
8003 AF 00240 XOR A ;A = 0
8004 67 00250 LD H,A ;SAVE IN H
8005 6F 00260 LD L,A ;HL = 0
8006 0611 00270 LD B,17 ;B = # OF BYTES TO GET
8008 C5 00280 LOOP PUSH BC ;SAVE COUNTER
8009 D5 00290 PUSH DE ;SAVE ADDRESS
800A 3E0F 00300 LD A,VDCCTL ;A = VDCCTL SVC #
800C 0601 00310 LD B,1 ;VDCCTL FUNCTION NUMBER
800E EF 00320 RST 28H ;GET BYTE FROM (HL)
800F D1 00330 POP DE ;RECOVER STRING ADDR
8010 C1 00335 POP BC ;GET COUNTER
8011 2005 00336 JR NZ,END ;GO ON ERROR
8013 12 00340 LD (DE),A ;SAVE IN STRING
8014 23 00350 INC HL ;HL==>NEXT SCREEN ADDR.
8015 13 00360 INC DE ;DE==>NEXT STRING ADDR.
8016 10F0 00380 DJNZ LOOP ;LOOP FOR 17 CHARACTERS
8018 C9 00390 END RET ;RETURN TO BASIC
8008 00400 END ;END OF ROUTINE
00000 Total errors

```

Program Listing 4. Model subroutine; TRSDOS 6.0 reads the system date and saves the present date.

Continued on p. 37

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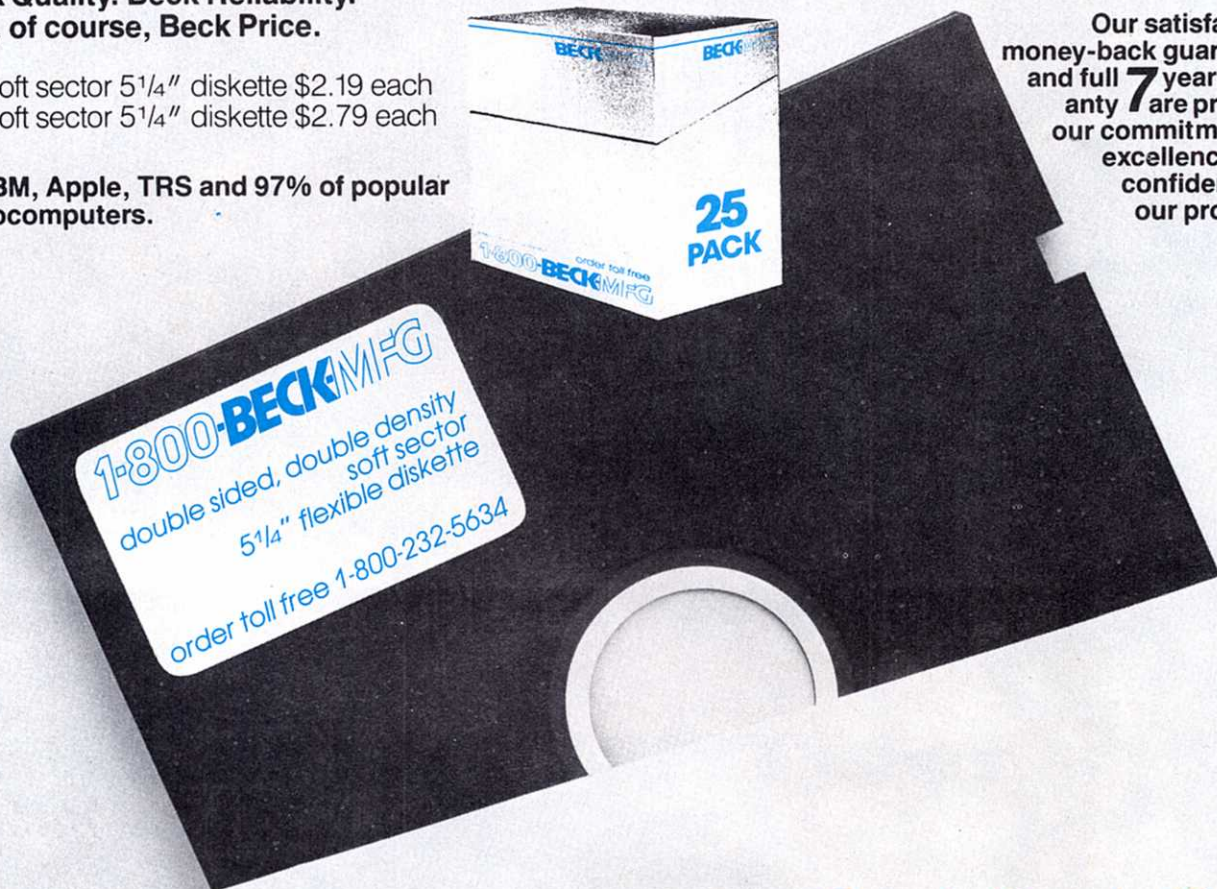
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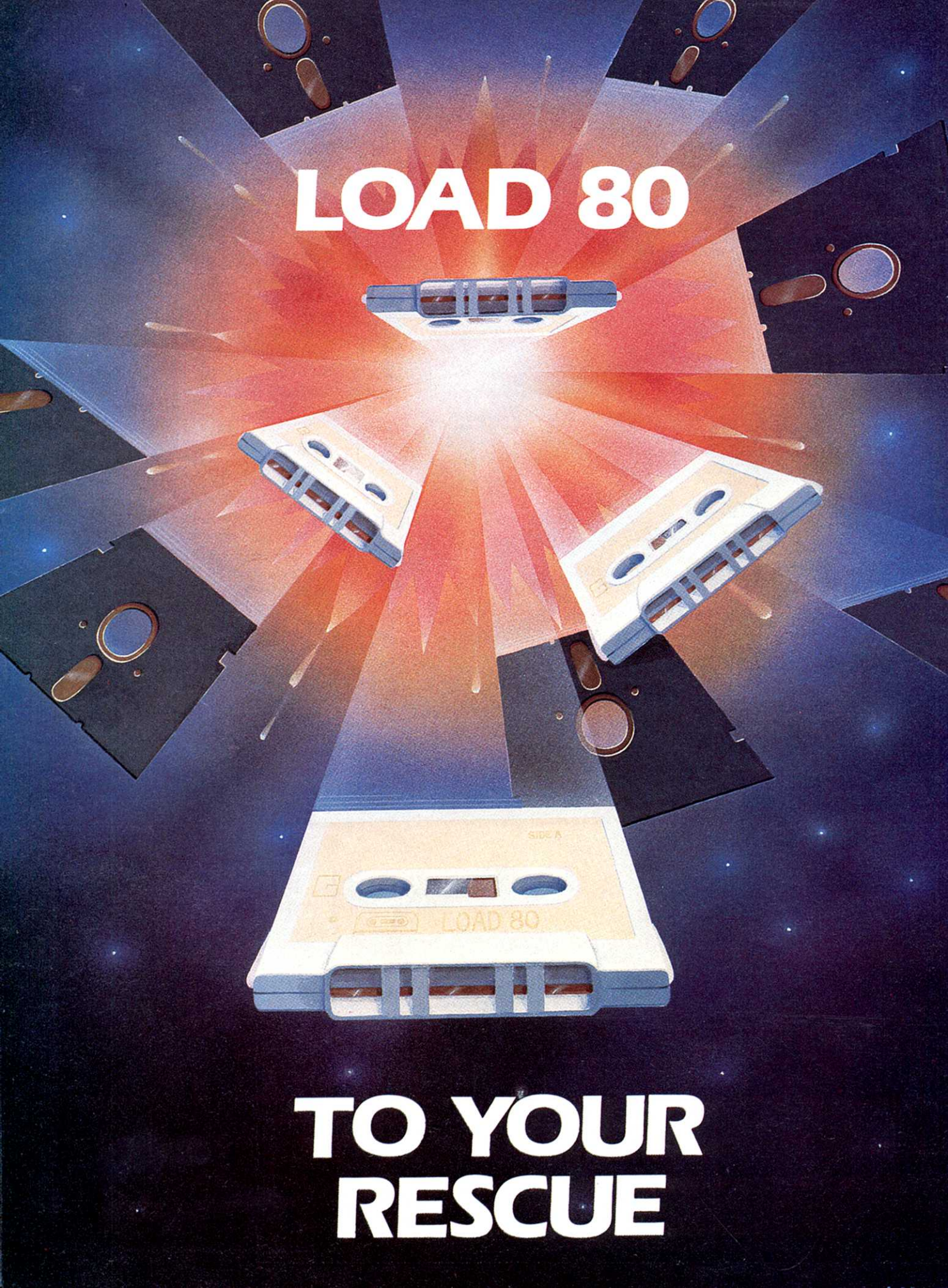


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COMPUSOFT HAS THE KEY

Continued from p. 32

Then a machine-language routine reads each character off the screen and POKes it into the appropriate location inside DAY\$.

Line 110 of the Basic program clears the screen and forces DOS to print the expanded date form in the upper left corner. Line 120 initializes X to 1 then sets up DAY\$ as 17 ASCII spaces. Lines 130-150 move the machine-language routine, stored in data statements, into CODE\$. The routine is relocatable, so CODE\$'s location in memory is unimpor-

tant. Lines 160-180 find the location of DAY\$, and place it in the integer Q%. Line 190 calculates the location of CODE\$ (the machine-language code) and places it in R. Line 200 does all the work, calling the machine-language routine at R (the address of CODE\$) and sending the address of DAY\$ to the subroutine. Finally, line 210 prints DAY\$ to verify a successful transfer, and then defines DAY\$ as common so it can be sent to another program with a Chain command.

The only way to move from Basic to a machine-language subroutine on the Model I/III is with a USR command. Model 4 Basic has two different commands to call a machine-language rou-

tine, both much more powerful. USR, in Model 4 Basic, can pass a single variable of any type (integer, single-precision, double-precision, or string) to the subroutine. The Call command can pass an unlimited number of variables of all types to a subroutine. A fundamental difference between the Model 4 and the Model I/III machine-language calls is that both Model 4 calls pass the address of variables instead of the values of variables.

When the program passes only one variable with a Call instruction (Q% in our program), the machine-language subroutine in the HL register pair receives its address. Lines 200-220 of Listing 4 load the address of the 17 spaces in DAY\$ into the DE register pair. The program sets register A to zero with an XOR A command and uses it to set both H and L to zero. (This roundabout way of zeroing the HL register pair avoids leaving zero bytes in CODE\$.) Then the program loads B with 17, the number of bytes to transfer from the screen to DAY\$.

Inside the loop, the program saves both BC and DE on the stack. Then it loads A with 15, the index value of the @VDCTL supervisor Call (SVC). None of the addresses of the DOS routines in

TRSDOS 6.0 are documented. Instead, the *Model 4 Technical Manual* supplies a list of approximately 100 SVCs. Each SVC provides one or more functions for interfacing your routine to the system. SVC 15, for example, is a collection of 8 video control functions.

To get a character from the screen, your program must load the A register with 15, the SVC number; register B with 1 to select the read-from-screen function; register H with the row number of the character's position (zero for the top row of the display); and register L for the column number in the row (zero for the leftmost column). An RST 28 hex instruction then fetches the character, returned in the A register. If the program doesn't set the Z flag, an error has occurred during the transfer.

After each fetch, Listing 4 saves the character in DAY\$ (line 360) and the program increments the HL and DE pointers for another fetch. It finishes by returning to Basic. If a fetch error occurs, the program returns immediately, and DAY\$ holds only part of the date display.

You could add an error-checking loop to the Basic program to be sure that DAY\$ doesn't end with a space, and to try the call again if it does, though I've used the routine many times and never seen an error generated. You could easily generalize this routine to read as many characters as necessary from the screen. Just remember to increment H for each new video row.

Another Model 4 Routine

Program Listing 5 shows a technique you can use on a Model 4 in Model III mode only. Line 40 forces A to alternate values of zero and 8. If you send a value of 8 to port 132, you enable the inverse video section of the Model 4's character generator, and can print inverse characters. To display an inverse character, set bit 7 of any normal character value to 1, creating a value between 128 and 255. Unfortunately, neither the ROMs nor DOS supports printing inverse characters on the screen, though it wouldn't be difficult to write a filter for the video driver to do so.

Back to the Beginning

So you thought you could get all the way through the column without actually typing in and running Listing 1, huh? Go back now and do it. Only those of you who have already run it

```

1  '*****
2  '
3  '   Demonstration of Inverse Video
4  '       on the Model 4
5  '       in Model III Mode
6  '
7  '*****
8  '
10 CLS: A=0
20 FOR I=0 TO 255
30   POKE 15360 + I, I
40 NEXT I
50 A = NOT A AND 8
60 OUT 132,A
70 FOR I=1 TO 500: NEXT I
80 GOTO 50

```

Program Listing 5. Inverse video on the Model 4 in the Model III mode.

```

10 REM -- Many of these lines will disappear
20 REM -- They could be used to hold a
30 REM -- Machine-language sub-routine
40 FOR I = 1 TO 7: Q=PEEK(16548)+PEEK(16549)*256
50 IF Q>32767 THEN Q=Q-65536
60 POKE 16548,PEEK(Q): POKE 16549,PEEK(Q+1)
70 NEXT I
80 REM -- Regular Program could start here
90 CLS:LIST

```

Program Listing 6. Routine to move Basic's pointer.

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I recently purchased your amber CRT for my Model III with anti-glare features. I seldom write regarding products I've purchased for the computer, but I felt that your product warranted a short note. I am extremely happy with my new CRT. The color is great, and easy on the eyes, as you claimed. Your documentation was excellent. I am by no means electronically inclined, but I had no problem with the installation.

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THE NEXT STEP

may read the next part.

What's happening in this program? If you translated the POKE addresses in lines 20, 40, and 50 to hexadecimal, you probably already know. I adjusted several low-memory pointers to achieve this effect. Line 20 moves the Array Variable Table and Free Space pointers (40FB hex and 40FD hex) up to a higher location in memory (remember those pointers from last month?). Then the program loads array A(n) with data values. Each data value is a combination of 2 bytes of the tokenized form of another Basic program. Finally, the beginning-of-program pointer (40A4 hex), as well as the variable table pointers, are adjusted to the beginning of the array area, 6F00 hex. Essentially, one Basic program has written another!

Moving the pointer can lead to all sorts of interesting techniques. Though the one in Listing 1 probably has only limited uses, it does serve to illustrate a major point: Basic programs (except for the next-line pointers they contain) are completely relocatable. You can store the lines of a Basic program anywhere in memory.

Programs running under Disk Basic are located much higher in memory than those running with a tape system to allow space for the resident DOS modules and Disk Basic enhancements. Also, the number and type of files you select on entering Disk Basic alter the starting point of your program.

When you add machine-language

routines to a Basic program, you have to worry about where to store those routines. You can put them at the top of memory, and protect them by setting the HIMEM pointer, or you can store them in low memory below the resident Basic program. It's easy to store programs in low memory with a tape system; unless you change the 40A0 hex pointer with a machine-language routine, the Basic program always starts in the same place.

It is more difficult to load a machine-language program below Disk Basic, because the value in 40A0 hex varies according to the number and types of files, and the DOS you use. However, if you load Basic before the machine-language program, life can be much simpler.

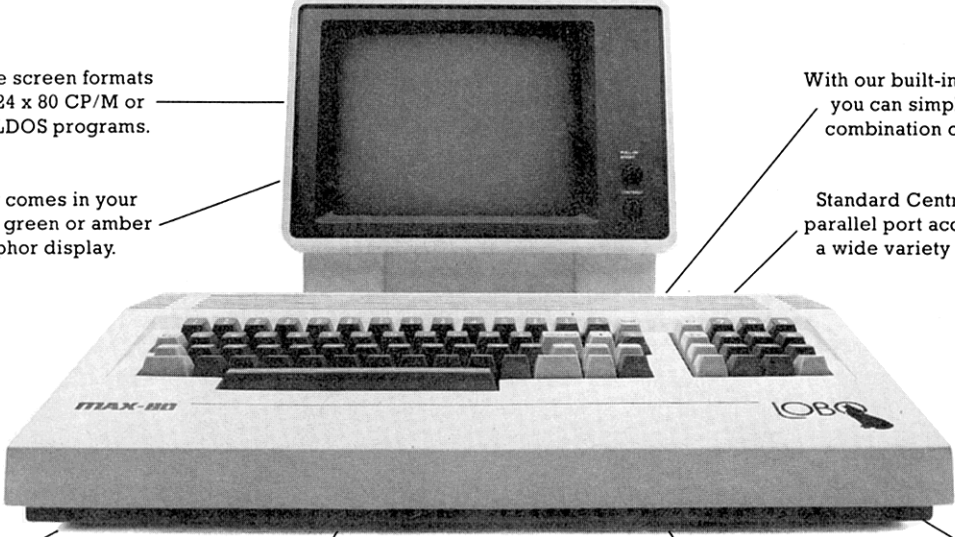
Load and run Program Listing 6. The first lines disappear when the program runs, because the program moves the 40A4 hex pointer up one line with each iteration of the loop. The program stores every line of Basic with a 2-byte header that points to the next Basic line. The 40A4 hex pointer holds the address of the first line in the Basic program. By moving that pointer, you can make the first lines invisible.

If you POKEd a machine-language program in the REM statements and then moved the 40A4 hex pointer, the subroutine would be completely invisible to the user. Better yet, it would remain in place no matter how many Basic programs you load and run. And

```
10 CLS
20 FOR I=0 TO 15: PRINT @ I*64+10,"FIRST SCREEN";: NEXT I
30 OUT 136,12: OUT 137,4: OUT 132,128
40 CLS
50 FOR I=0 TO 15: PRINT @ I*64+30,"SECOND SCREEN";: NEXT I
60 OUT 132,128
70 A%=4
80 FOR I=0 TO 6: FOR J=1 TO 200: NEXT J
90 A%=NOT A% AND 4: OUT 137,A%
100 NEXT I
110 OUT 136,13
120 FOR I=0 TO 255: OUT 137,I
130 FOR J=1 TO 20: NEXT J,I
140 OUT 137,0
150 FOR I=0 TO 31
160 OUT 136,13: OUT 137,(I-INT(I/4)*4)*64
170 OUT 136,12: OUT 137,INT(I/4)
180 FOR J=1 TO 100: NEXT J,I
190 OUT 136,12
200 FOR I=0 TO 500:A%=NOT A% AND 4
210 OUT 137,A%: NEXT I
220 OUT 132,4: FOR J=1 TO 900: NEXT J: OUT 132,0
230 OUT 136,12: OUT 137,0
240 OUT 136,13: OUT 137,0
```

Program Listing 7. Use the 2K video RAM to enhance regular programs on the Model 4.

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best of all, it could contain bytes of 00 hex without adversely affecting the resident Basic program. It's absolutely safe.

As one reader, Jim Kyle of Oklahoma City, OK, pointed out, the addresses set by DEFUSR commands don't change with New, Clear, Load, or Run commands. Nor do the values in 16526/16527 for tape systems. Therefore, the same machine-language program is available once it's loaded and the relevant pointers are set.

One More Model 4 Routine

Jim Kyle has also done some explorations with the Model 4 video control that I think you'll find interesting. If you have a Model 4, put it into Model III mode, and run Program Listing 7. Be sure to let it run completely to the end. You should be surprised by the results.

If you don't have a Model 4, you might want to go to your local Radio Shack store or Computer Center and try

it. It will work on all versions of the Model 4, from the 16K RAM tape-based model up to the 128K RAM hard-disk setups, as long as they are first put into Model III mode.

This program illustrates how the 2K video RAM enhances regular programs. If you're going to experiment with other port outputs, first pull the disks from the drives so you don't inadvertently turn on a drive and erase something.

The program operates by acting upon the CRTC (cathode ray tube controller) chip inside the Model 4. Output port 132 (84 hex) selects several systems options, including placement of the cursor (paging) inside the 2K of video RAM and toggling between the 64-character and 80-character display modes. Output ports 136 and 137 directly address the CRTC, in effect telling it the location, in the 2K of video memory, of the top of the screen. The CRTC sees the video RAM as completely circular, with complete wraparound from the end to

the beginning, and it's impossible to send an invalid address.

With that introduction, you should be able to figure out how the program works, and use the same techniques in your own programs. You could, for example, change last August's screen swap program to use the other half of video RAM and save 1K of program memory space. ■

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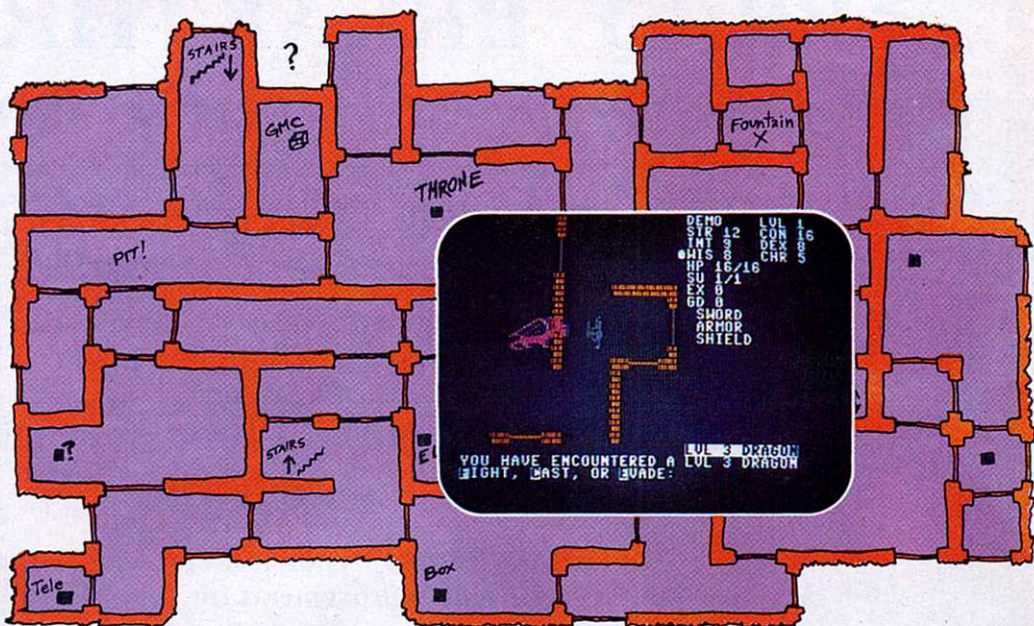
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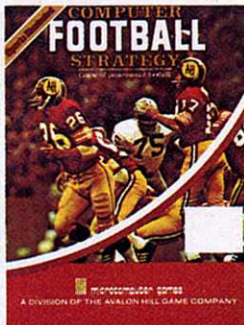
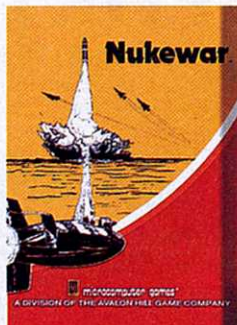
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gram speaks any control or escape key-strokes, such as enter or backspace. If you want to totally disable the voice, you have to reboot the system and disable the program's autoloading and execution by holding down the enter key.

The package's only drawback is its documentation, which is poorly written and somewhat disorganized. As a result you have to read the entire manual before you can fully understand what's supposed to happen and how. A severely visually handicapped person would require the assistance of a sighted person for initial setup of the program. Fortunately, The Talking Program's author, Ron Hutchinson, lists his phone number and invites anyone having problems to call him for help.

When I first received my copy of The Talking Program, it worked perfectly. However, when I tried using my LDOS disk instead of Hutchinson's, the initial configuration of the RS-232 port locked up my system.

Phone calls to Logical Systems revealed that Ron and I had different releases of LDOS 5.1.3, and my version

didn't use precisely the same driver locations as his. Logical Systems gave Ron information to make his program compatible with all versions of LDOS 5.1.3.

At this time you get two versions of Ron's program on the distribution disk: the standard version, Talk, and Talk1. Talk1 is a special version for operation with Scripsit.

The Talking Program is a simple-to-use package for converting TRS-80s into talking computers. Although the Votrax speech unit takes getting used to and slows down operation of the computer (which waits for it to speak or spell its present data before sending more), that's a small price to pay for being able to use a computer.

For more information on which programs do or don't work with The Talking Program and on which computers, call Ron Hutchinson. I recommend this program to anyone who is visually handicapped. While not all programs work with it, enough do to make it a worthwhile investment. ■

shortcomings and added some new commands.

Your first step in using Arranger II is to rename all your disks. You must do this if you want to use the program in the automatic update mode.

Whenever you want to update a disk you've previously added to the library, insert it into the drive and enter the Update command with one keystroke. The program goes to the directory, searches the name, and automatically replaces the old data with the updated information. To use this feature, you must give each disk a unique name.

The program also uses the names to sort the disks, so it is advantageous to numerically name the disk (e.g., 001GAMES). You can use up to eight characters, letters, or symbols in any order.

The Filter function can selectively list disks of a certain category. For instance, if you set the condition for disk names to ???GAMES, the program lists only the game disks in your library.

The Rename command makes changing names easy. However, it contains one minor inconvenience when you rename a disk that's already in the master list. You must manually delete the disk in the master list and then add the disk with the new name to the list. The original Arranger did this automatically, and it's a feature that Triple-D should have retained.

Once you've renamed all your disks, you must enter them into the master list. This task is a little cumbersome with only one disk drive because of the necessary disk swapping. One nice feature is that the program never crashes.

If it prompts you to insert the Arranger II disk and you put in your only copy of a great arcade game instead, the program won't destroy your game. It

★★★★½

Arranger II
Triple-D Software
P.O. Box 642
Layton, UT 84041
Models I, III, and 4
\$49.95

by Ronald Cangro

The Arranger II is an excellent disk directory cataloging program for the Model I (with a double-density adapter), the Model III, or the Model 4. The self-booting disk recognizes the computer you're using and configures itself correctly on initialization.

If you own a single-density Model I, you can still order the original Arranger. It doesn't have all the Arranger II's features, but it's still one of the best disk libraries available.

Arranger II has several indispensable features and others that are simply handy. At the top of my list is the ability to recognize all major disk operating system directories; Arranger II treats all disks equally.

This program recognizes my TRS-

DOS, NEWDOS/80, DOSPLUS, and MULTIDOS disks, not to mention LDOS and DBLDOS. It also automatically recognizes single- or double-density disks to provide compatibility with the Models III and I double-density systems.

The program is written in machine language, a big plus for speed. It sorts 1,500 file names in less than 40 seconds! The program and data reside on the same disk, which can store up to 11,000 programs with up to 255 file names per disk.

The Beginning

To use the Arranger II, insert the disk in drive zero and press the reset button. The program checks to see how many drives are active on the system and configures itself accordingly. It works with one to four drives of 35, 40, or 80 tracks. You can also use the 80-track drive to update 35- or 40-track disks automatically.

The main menu (see Fig. 1) gives you an idea of this program's power and flexibility. For those of you familiar with the original Arranger, Triple-D Software has corrected most of its

ARRANGER II—By Dan Foy

(A)dd a diskette	(U)pdate a diskette
(F)ind a program	(V)iew disk names
(S)can diskettes	(L)ocate free grants
(P)roduce alpha list	(R)ename a diskette
(T)oggle auto/manual	(B)ackup the Arranger
(M)anual add	(C)hange filter
(D)elete a diskette	(E)xit the Arranger

Command: (U)

Figure 1. Main menu screen.

checks first to see if you entered the right disk, then lets you know in a friendly way that you did something wrong.

The Add command initially enters all your disks. Arranger II prompts you to insert the disk you want to add and automatically does the rest. The program finds the directory, reads it in, displays it on the screen, and then adds it to the Arranger II file.

The program is smart enough to recognize an unformatted disk or one already on file, and lets you know its sta-

tus. You can even print a disk label by pressing the clear key after adding or updating the disk.

In addition to recording the file names on an update or disk add, the program records the number of free grans, disk name, date last updated, disk type (system or data), density, and DOS type. The program doesn't determine the DOS type with a single-density disk, but sets it to SDEN. You aren't allowed a comment line describing the program.

You should have a printer on your

system to take full advantage of this program. However, Triple-D realizes that not everyone has a printer or wants to print out a complete list all the time. Therefore, all the commands display data on the video screen.

If more information is present than can appear on the screen at one time, you can use the arrow keys to scroll up or down through the data. By pressing the clear key, you direct a printout to the printer.

Commands

The View command displays the names of all the disks on file, including the date last updated, type of DOS (if the disk is double density), disk type, and number of free granules available.

The Scan command lets you page through your disk library a disk at a time. The pertinent disk data appears along with all the file names on the disk. You use the plus and minus keys to step through the library one disk at a time.

I find it inconvenient to press the key each time I want to advance to the next disk. It would be nicer to hold down the key for a continuous scroll.

If you want a printout of any individual disk, you use the clear key when the disk appears on the screen. If you want a complete listing of all your disks, press the shift/clear keys simultaneously (see Fig. 2). This is a handy feature.

The Find command searches the file for a specific file name and displays all disks on which it finds that file name. Arranger II also finds partial names. If you enter TEST as the file name, the program finds all file names starting with TEST, including Testing, Test/BAS, and Test/CMD.

This doesn't work if you're looking for file names that end in TEST or that contain only a specific sequence of letters. You can also search for a specific extension, such as /BAS.

The Locate command is a timesaver. It quickly finds the disks that have a specified amount of free space. Arranger II asks you the minimum amount of free space you need, and you answer by entering the number of granules.

It then searches through all the disks and displays those that have at least that much unallocated space. This feature is great when you're trying to find enough space for a particular program.

Another useful command is Produce

SCAN						Page 1
Disk Name	Updated	Density	Dos Type	Grans	Trks	Type
=====	=====	=====	=====	=====	=====	=====
001GAME	08/06/82	SINGLE	SDEN	1	35	SYSTEM
ZAPPER/CMD	STAR4/BAS	TREK1/BAS	STARGARD/BAS			
CLIMBER/CMD	NIGHTR/CMD					
Disk Name	Updated	Density	Dos Type	Grans	Trks	Type
=====	=====	=====	=====	=====	=====	=====
025GUESS	05/13/82	DOUBLE	NEWDOS/80	12	35	DATA
DOTS/CMD	SAVE/BAS	TALK/DAT	PROG/BAS			
VOX/CMD	LIST	LOAN	TYPE/CMD			
SKOOL/BAS	ENTRAP					

Figure 2. Sample Disk Scan command output.

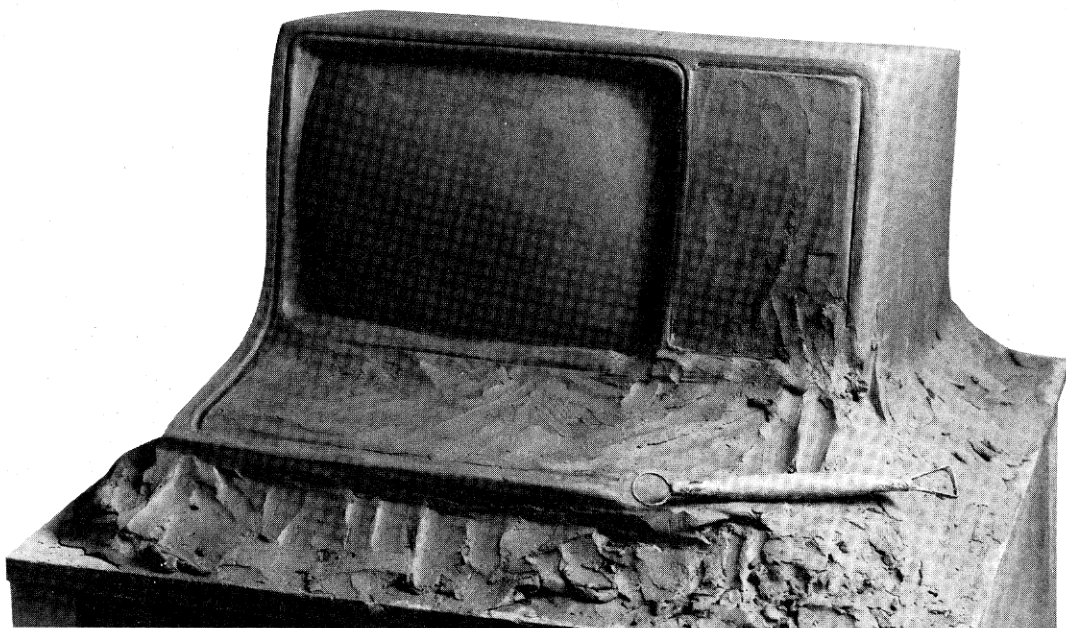
ALPHA LIST				Page 1
ACCESS.....027NEW1	CFB.....005TEST	DATE.....034DATA		
ACCOUNT.....006BUSS	CHESS.....010NEW1	DEEPDIVE....003BGAM		
ALIEN/CMD....002GAM	CLEM/BAS....004MUSIC	EDIT/CMD.....009SYSA		
BASV20/ILF....023SYSB	COM/CMD....028COMM	FLASH/BAS....065JUNE		
BUDTRAK.....041BUD	CRYPTO/CMD..002GAM	GOLF/BAS....003BGAM		
BUSGRA/CMD..057BUSN	DATE.....033BAKUP	KEEPER/DAT...014TEST		
BUSGRA/DAT..057BUSN	DATE2.....033BAKUP	SAFETY/BAS..008DUMY		

Figure 3. Sample alphabetical listing.

<< Change Filter Mode >>					
Press ARROWS,<SPACE> to select,<ENTER> for menu,<@> to reset					
→ Disk name: ???????? (All 99 disks allowed)					
DOS Type allowed:					
DOSPLUS	NEWDOS/80	DBLDOS	PROTECTED	SDEN	
Disk type: SYSTEM DATA					
No. of tracks: 35 Other					

Figure 4. Change Filter screen.

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Alphabetical List. You can output all the file names on the master list in alphabetical order, along with the disk name where they reside (see Fig. 3). You can specify a sort to include only a specific file extension, such as /CMD or /BAS.

As with the other commands, if you want a printout of this data, you can direct the output to the line printer by pressing the clear key. The program formats the data alphabetically by column in three columns of 60 rows per page. If you have more than 180 cataloged programs, the program spaces to the next page and continues printing.

The output on the video display also appears consecutively in rows, and the arrow keys control screen scrolling. A limitation of this command is that it can't specify printer options such as number of columns or lines per page. It would also be nice to have the date appear along with the title and page number.

Several commands new to Arranger II are Delete Disk, Manual Add, and Change Filter. The Delete Disk function lets you remove a disk from the master list.

The Manual Add command lets you type in the name and files of a disk rather than having the program read it automatically. This is useful for protected or nonstandard disks, such as self-booting games. The program sets the rest of the information to a default of protected DOS type, 35 tracks, and zero granules.

The Change Filter command is by far the most powerful (see Fig. 4). It lets you isolate any part of your disk library by setting up conditions based on the disk name, DOS type, disk type, or number of tracks.

A wildcard character selects the disk name. If you want to limit your searches to only those disks with a name beginning with the letter A and a Z in the third character position, you enter A?Z????? for the disk name. Mastering

this command saves you a lot of time.

Toggle and Backup are two miscellaneous commands. Toggle switches from a manual disk name entry to automatic and back again. This is useful when you don't want to rename all your disks. The manual mode requires that you enter the disk name to add or update the disk. The automatic mode, the preferred method, reads the name automatically from the disk directory.

The Backup command lets you make a back-up of the complete program and associated data file.

Arranger II is a high-quality disk cataloging program. Triple-D took care to ensure compatibility and to maintain ease of operation. The program arrived promptly and the company is helpful in providing support. Also, Arranger II's error-trapping is excellent.

Now that I've used this utility, I don't want to be without it. If your library of disks is growing, you need Arranger II. I heartily recommend it. ■

★★★

VisiCalc Business Forecasting Model
Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
\$99.95

★★★½

Vis/Bridge/Sort
\$79

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★

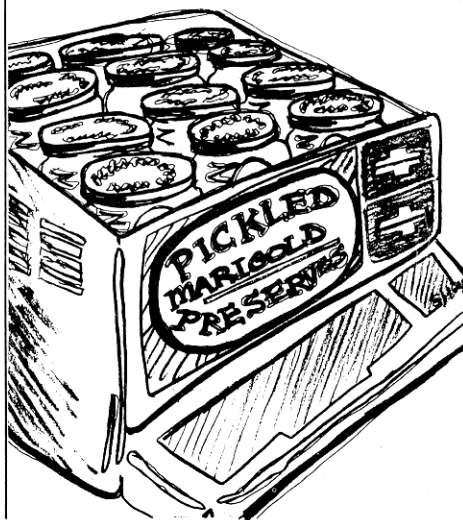
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by G. Michael Vose

an existing program, VisiCalc. These four spreadsheet stretchers provide additional power and flexibility, including sorting, report formatting, consolidation of templates, and a business forecasting model series.

VisiCalc Business Forecasting Model

The VisiCalc Business Forecasting Model (BFM) is a series of seven templates for the popular spreadsheet program. These seven templates comprise four financial models (with three support templates) that permit business



analysis and forecasting, including the projection of profit and loss, calculation of financial ratios, and balance sheet manipulation.

To use BFM, you need a Model III with 48K and at least one disk drive, VisiCalc/TRSDOS 1.3, and a printer. The BFM software presumes some understanding of both VisiCalc and financial modeling.

BFM is a complex financial analysis tool. It is designed primarily for manufacturing, distribution, and retail businesses doing from a few hundred thousand to several million dollars worth of business per year. BFM would be of little use in your family pickled-marigold preserves business unless pickled-marigold preserves really catch on.

The BFM templates provide an Income Statement to track the performance of a business over a period of time, typically one year; a Balance Sheet, a fiscal snapshot of a firm on a given date; a Statement of Cash Flow for predicting the amount and date of needed capital; and a Financial Ratios statement, a common method for determining a company's performance in its marketplace.

To build these four models, you use three support templates to calculate your business's sales and costs of goods sold,

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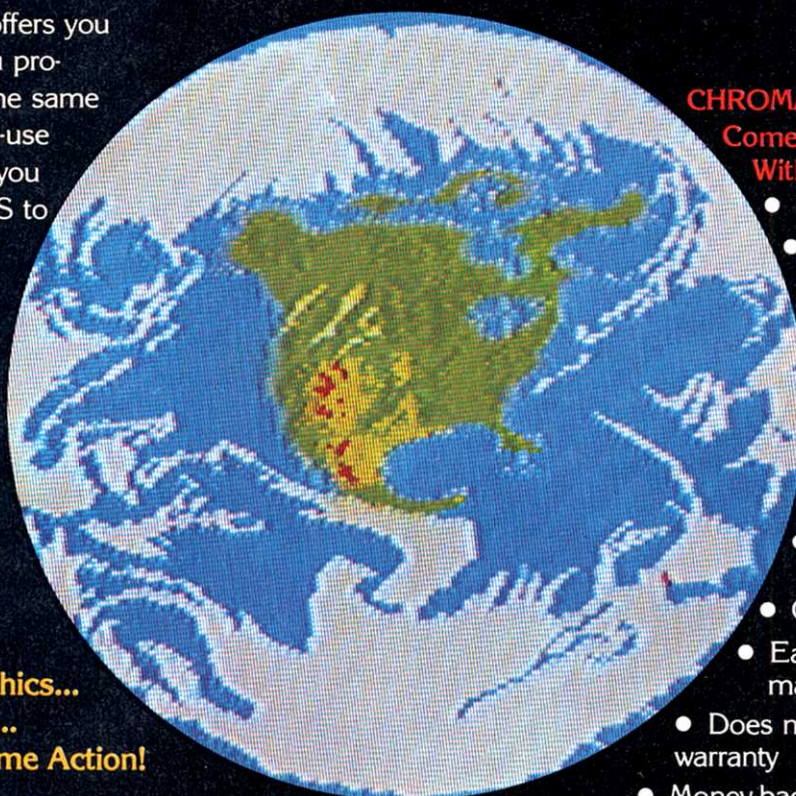
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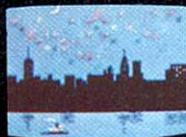
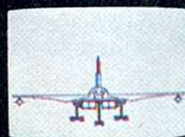
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REVIEWS

salaries, and assets and depreciation.

The support templates provide data for the four models. Some of the data in each model is used by the other models as well. The sections of a model used by another model are called *drivers* in the BFM lexicon. Drivers make use of VisiCalc's DIF (data interchange format) capability.

As you might expect, the BFM models can be quite large. BFM instructions suggest a minimum of two formatted data disks for building your company's financial models.

Because of its complexity, BFM is best used after studying the manual tutorial. This tutorial takes up 46 of the manual's 102 pages.

The tutorial also uses several sample templates included on the master disk. Together with the written material, these samples provide a walk-through of building four financial models for the fictional ABC Model company.

The sample templates contain most of the data for analyzing ABC Model's performance over a five-year period, and the tutorial's pages provide some additional data and instructions to enter it.

The seven tutorial lessons describe how you build the support templates, save these files, then load them into the appropriate model(s). The last lesson guides you through the complicated, labor-intensive, iterative calculation of interest rates.

The interest rate calculation requires that the program pass information in the Income Statement and Balance Sheet templates back and forth. This is necessary because banks use different interest rates depending on an assessment of the debtor's ability to repay, usually determined by the Balance Sheet.

The BFM models consider Interest Expense to be a cost of doing business, however, and include it on the Income Statement. Correct calculation of this expense can require as many as six exchanges between the two templates.

Each exchange involves saving the relevant figures in a DIF file, exiting the current worksheet, loading the other worksheet, then loading the relevant DIF file numbers. The program makes new calculations and you must repeat the process to return to the other template.

Presumably, other ways exist to calculate interest expense with less work. But for the manager without access to

financial consultants, BFM's capability to make these calculations is an asset.

You can walk through the tutorial in one and a half to two hours. At its conclusion, most managers will have a good grasp of BFM's inner workings.

BFM's two principal strengths are its manual and its parent—VisiCalc.

Professionally prepared by VisiCorp for resale by Radio Shack, BFM benefits from being an application of VisiCalc. You can easily master VisiCalc in a few hours, unlike programming languages that can take years to master for complex applications.

Once you learn its command structure, you can concentrate on the important matters—your data. Most managers are familiar with important data about their firm or department.

A VisiCalc application benefits too from the relatively simple modifications that you can make to a template. Modifying a Basic or Pascal program can be a nightmare, but a spreadsheet is easy to change to suit your own particular need.

To make BFM easy to modify, as well as use, requires a good manual. The BFM manual has three sections. Section one is a 16-page outline describing what BFM does, its component parts, and what you need to operate it.

Section two is an excellent tutorial divided into seven lessons, none of which is too long. Section three is for reference, explaining the formulas used and their rationale.

The writing is cordial, professional, and jargon-free with short paragraphs and lots of individual headings. This makes possible the most comprehensive index I've seen in an instruction manual: six pages and over 500 cross-referenced entries.

BFM has a few weaknesses. It is complex, you can't print most of the models all at once, even in 132-column format, and none of the models are directly suitable for a specific business (not a weakness, but merely an inconvenience since modifications are easy).

These disadvantages are minor in the software business. The three-star rating is only because I believe BFM has limited appeal, mostly confined to managers and accountants of substantial businesses.

Vis/Bridge/Sort

Vis/Bridge/Sort is a VisiCalc utility

that sorts portions of a spreadsheet. It sorts numeric or alphabetic data using as many as five sort keys, and sorts rows or columns.

To use Vis/Bridge/Sort, you need a Model I, II, III, 12, or 16, 48K RAM, a disk drive, and VisiCalc.

The program works with special identifiers surrounding the data you want to sort. You insert these identifiers by opening up the borders of your spreadsheet using VisiCalc's /IR and /IC commands. Vis/Bridge/Sort uses negative numbers to specify a descending sort and positive numbers for an ascending sort.

Once the identifiers are in place, you save the worksheet as a DIF file. With this file in place, you exit VisiCalc and load Vis/Bridge/Sort: You answer a few prompts to tell the program which file to sort, whether you want a row or column sort, and the beginning row/column values.

The utility then takes over, sorting your file and reloading VisiCalc. You now load your old file and a file that invokes VisiCalc's Move command, which rearranges your original spreadsheet in sorted order.

You learn to use Vis/Bridge/Sort by following a manual tutorial that uses a sample data file included on the program disk. The tutorial takes about 20 minutes. In an hour's time, you can sort your own spreadsheets without difficulty.

You get a no-frills, 17-page manual that is accurate and simply written. The program is so straightforward in operation that you need little outside support. (The rest of the microcomputer software world could benefit from looking at VisiCalc manuals generally.)

All is not roses with Vis/Bridge/Sort, however. Its major problem is its price, \$79. This is almost a third the cost of VisiCalc itself and might be too high for all but the most sort-happy spreadsheet jockeys.

Now that VisiCorp, and presumably Radio Shack in time, offers VisiCalc IV with built-in sort capability, maybe Solutions Inc. will lower the price on the product. A \$29.95-\$39.95 range would be much easier to take.

Another quibble I have with this utility is the need to clean up your files after sorting. You must go back to your unsorted file and take out the identifiers if you want to print or reuse the original data. While I understand that this diffi-

culty probably doesn't have a solution, I couldn't help disliking this corruption of my original files.

Nevertheless, if sorting spreadsheets is a function you need in your work, Vis/Bridge/Sort is a valuable addition to your VisiCalc utility library.

Vis/Bridge/RPT

The company that offers Vis/Bridge/Sort offers another VisiCalc utility that provides (within printed reports) variable column widths, decimal point alignment, and segmentation of spreadsheets too large to print on a single sheet of paper—with the option of adding report titles, page numbers, and the date.

The Vis/Bridge/RPT utility also offers a function to create print image (ASCII) files on disk for use outside VisiCalc (telecommunications transmission, inclusion in word-processing reports, and so on).

Vis/Bridge/RPT is even easier to use than its cousin. You only need to insert a single column of identifiers at the top of your spreadsheet to tell the utility how to format your reports. These identifiers specify column width, column justification (left, right, center), digits after the decimal point, and omit or include column.

Once the identifiers are in place, you save the spreadsheet as a DIF file, exit VisiCalc, and load Vis/Bridge/RPT. You then answer nine prompts to print your formatted report.

You can specify a title that optionally prints at the head of each page, carry column and row labels from page to page when printing spreadsheets that don't fit onto single pages, and add page numbers and the date to each page—all by simply answering a few prompts.

Like Solutions Inc.'s other package, the manual is brief but complete. I did not rate this program because I could not fully test all its features. But like Vis/Bridge/Sort, it's a well conceived and executed program; only its price might be called into question.

Viz.A.Con

Viz.A.Con is a VisiCalc worksheet consolidation utility. It consolidates data from different worksheets, for example, to merge sales figures from Canada and the U.S. into a North American data file. The utility also provides report formatting with customized titles, row

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and column headings, and footnotes.

The program requires a Model III, 48K RAM, a disk drive, and TRSDOS 1.3/VisiCalc.

Viz.A.Con makes extensive use of the VisiCalc DIF capability. It is a disk intensive program—two disk drives are a practical necessity.

This is an extremely complex system. You must enter a minimum of 21 responses once you enter Viz.A.Con to prepare a new consolidation process. You do this after you create the separate spreadsheets that will be combined and save them in DIF format.

Unfortunately, the problems with this program are so numerous and apparent that it is difficult to imagine its use in a serious application.

The flaws I discovered immediately included that files to be consolidated have to be the same size (if they are not, you have to modify them). Viz.A.Con also prints reports with integer format for numeric data. Printing the data from VisiCalc overcomes this deficiency but adds more steps.

You have to keep notes on a form provided in the manual to keep track of what you're doing. The manual pro-

vides no tutorial and no sample data files to experiment with, and the manual, while extensive, does not explain how to use the program (possibly because no explanation exists).

Viz.A.Con is a classic example of a program that only its author could use. It's a nice try, but it incorporates all the inadequacies that VisiCalc is designed to avoid: rigid, over-repeated prompts; a preoccupation with the mechanics of its operation (you don't see your data for long periods and that makes me nervous); and a lack of flexibility. ■

★★★★★

Model 4 Technical Reference Manual
Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
Hardcover, 389 pp.
\$24.95

by Mark D. Goodwin

Radio Shack has recognized the need to provide Assembly-language programming information by producing an excellent *Model 4 Technical Reference Manual*. This is also a complete reference manual for anyone who wishes to repair or modify his computer.

The *Model 4 Technical Reference Manual* comprises two major parts. Part one provides complete details on the Model 4's hardware, beginning with a brief but thorough description of the general hardware configuration.

This introductory section provides instructions for upgrading to 128K of RAM and for installing the Model 4 graphics board option. Next, the manual presents disassembly and assembly instructions covering the case, CPU board, FDC board, RS-232 board, main power supplies, disk drives, video monitor, and video board.

The remainder of the hardware section provides other information about the CPU board, the disk interface and drives, the power supplies, the video monitor, and the RS-232 board. This includes explanations of each board's major functions, schematics, component layouts, circuit traces, and parts lists.

The second part of the manual is a wealth of information for the Assembly-language programmer. It begins

with explanations of disk organization and files, device control blocks, the drive code table, the disk input/output (I/O) table, directory records, the granule allocation table, the hash index table, and file control blocks.

“The sample programs demonstrate how you can use the SVCs in your own programs.”

The manual then presents programming guidelines covering the restart (RST) vectors; checking the break, pause, and enter keys' status; and interfacing the task processor. Bank selection for 128K machines, and device drivers and filters are other topics of interest.

The rest of the software section explains supervisor calls (SVCs), presents sample programs, and documents a few advanced TRSDOS commands. The SVCs are TRSDOS routines that you can easily implement in Assembly-language programs. The routines cover keyboard input, printer and video I/O, disk I/O, and a host of other useful functions.

The sample programs demonstrate how you can use the SVCs in your own programs. They are quite good and contain sufficient comments to make them clear.

The manual also features an excellent table of contents and a complete index. This manual is definitely worth \$24.95. Its information is essential for the Model 4 hardware enthusiast or Assembly-language programmer. ■

★★★★★

DWP-210 Printer
Tandy/Radio Shack
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by Charles Gulick

Radio Shack's DWP-210 is a superb and, at \$799, competitively priced printer. It has all the quality for which the Daisy Wheel is famous, and the same interchangeable print wheels, but with 100 characters (see Fig. 1) instead of the 124 characters on the DWP-410 and Daisy Wheel II printers.

The DWP-210's 13-inch platen is 2 inches shorter than on its larger counterparts. Its speed is a respectable 200 words per minute. You have the choice of high-quality, multistrike carbon or nylon fabric ribbon cartridges, and you get original and two-carbon capability.

The unit itself has substantial, impressive construction. Its handsome, user-considerate design includes Tandy's new fawn gray case color.

Unless you work with foreign languages, you probably won't miss the 24 characters left off the 210's wheels. And you'll be pleased at some of the characters included, such as the copyright, trademark, and registered symbols.

So what's new? For one thing, the price is dramatically low for a printer of this quality. Judging by its weight (38 pounds, heavier than either the DWP-410 or DW II), this printer is built for serious, long-run performance.

Great news for Color Computer users is that the DWP-210 gives you a choice of serial or parallel interfaces, DIP (dual in-line package) switch select-

!"#\$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN OPQR
STUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~°´µ®©ç

Figure 1. DWP-210 type font with Courier 10 print wheel.

able. Now the CoCo has a letter-quality printer.

This is the first Radio Shack Daisy Wheel printer to offer both interfaces, though several of the current dot-matrix printers do. The double feature is certainly a boon to desk logistics for anyone with more than one computer.

Besides the CoCo, the 210 interfaces with Tandy Models I, II, III, 4, 12, 16, and the new 100 portable. It offers a switch-selectable baud rate of 600 or 1,200 bits per second.

You can access all function switches, including the DIP set, from the printer's front/top. The DIP switch is neatly concealed under a sliding cover.

An operating panel at front left groups together the on line/off line and pitch select switches, and the power on and alert lights. The printer has a ribbon end photoelectric sensor plus paper-empty and cover-open detect switches.

The ribbon cartridge loads simply and takes just seconds. (By the way, the cartridge provided with my unit was in a Diablo package, which might tell you something.)

Changing the character wheels couldn't be easier—pull back a lever, slip out the resident wheel, and drop in a new one. You do have to remove the ribbon cartridge first.

A Courier 10 wheel comes with the printer, and a variety of other fonts will

“The ribbon cartridge loads simply and takes just seconds.”

be available. The operating manual mentions special wheels, but doesn't describe what they will accomplish. At any rate, a DIP high/low impact switch suggests that something cute is coming.

Print density and type uniformity are excellent, and by Daisy Wheel standards the machine is quiet—around 65 decibels. A “silence cover” is integrated

into the streamlined design.

The DWP has automatic impact control, said to prolong print wheel life, and a bidirectional logic seeking feature that you should enable (DIP switch 6) for maximum printing speed.

One minor flaw: The rear edge of the cover, against which you tear off the printed copy, is not well supported so it takes a little care to assure an even edge. The best way I've found is to position the fingers of one hand lightly on the Plexiglas as you tear, without applying any downward pressure.

You can remedy the only other fault I find with the optional bidirectional tractor feed (26-1443). I'm using fanfold bond paper, and it tends to shift to the right when printing multiple pages. This is a minor inconvenience that I can overcome with a little manual attention.

All in all, the DWP-210 is a very well built and cost efficient Daisy Wheel printer, with all the most desirable features you could expect at its price. It should be able to hold its own against the competition and serve the serious user handsomely for a long time. ■

★★★★★

Soul of CP/M

Mitchell Waite and Robert Lafore

Howard W. Sams & Co. Inc.

4300 West 62nd St.

Indianapolis, IN 46268

Softcover, 391 pp.

\$18.95

by Alan Neibauer

S*oul of CP/M* can have anybody writing and understanding Assembly-language programs within one hour. For those of you who find low-level languages frustrating and difficult to understand, this new CP/M manual is remarkable.

Soul of CP/M doesn't explain CP/M functions like DIR, STAT, and PIP; it's intended for persons already familiar with the popular operating system.

To get the most from the book, you'll

need a CP/M disk with DDT, Load, and ASM. Model I users with recompiled versions of CP/M will have little trouble applying the logic and sample programs to their system.

But because Assembly language is taught using built-in CP/M system calls, it's difficult to transfer the techniques presented here to some non-CP/M systems.

Organization

Waite and Lafore make learning Assembly language easy because they use CP/M BDOS (Basic disk operating system) system calls that automatically handle most input and output routines. The calls provide a sort of library of subroutines that saves the novice from manually writing these functions into a program. You only have to learn basic calling sequences for each routine to perform complex input/output (I/O) tasks.

By linking the calls with the DDT

debugging program, you almost have an immediate mode like Basic's with which you can experiment. You can write a short Assembly-language program, save it, and run it without the long compilation process. If you make mistakes, you can reload DDT and the program and check for errors.

The opening chapters introduce CP/M and explain the use of several basic system calls as well as a few Assembly-language instructions. By the end of the second chapter, however, you understand the mvi, call, rst, jmp, ora, jz, jnz, pop, push, inr, cpi, and ret instructions. The book covers the Console Output, Get Console Status, and Console Input calls.

To make this progress, the authors explain the use of DDT, CP/M's debugging monitor. They guide you through calling up DDT and placing it in the assemble mode. As you type instructions, the monitor automatically assembles them.

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REVIEWS

```
0100 mvi c,02 (prepare for system call)
0102 mvi e,38 (place ASCII for 8 in E)
0104 call 5 (call console output to print character in register E)
0107 mvi c,02 (prepare for system call)
0109 mvi e,30 (place ASCII for zero in E)
010B call 5 (call console output to print character in register E)
010E jmp 100 (loop back to 100)
```

Program Listing 1. Assembled program to fill the screen with 80.

For example, to output a character to the screen, place the value 2 in the C register and the ASCII value of the character in E. The call is made to address 5, the console output system call location.

Writing an Assembly-language program to constantly fill the screen with 80 requires calling the routine twice. First, invoke DDT from the system prompt: A> DDT.

The program is written and assembled starting at location 0100, so enter the command a100. Now as you enter Assembly-language instructions, DDT assembles them. The final program appears as Program Listing 1.

Once you write the program, enter a blank line for the next instruction to exit the Assembly mode. The command g0 returns to the system prompt. Save the short program, still in memory, to disk with:

A> save 1 show80.com

You can load and execute the sample program, now saved on disk under the file "show80.com", directly from the system with A>show80.

By using the system call, you don't have to write the actual output (display) routine itself. In fact, you can write simple programs for input just as easily using the Get Console Status routine.

Use of these BDOS functions frees you from much of the mechanics of Assembly language and lets you concentrate on the logic and syntax.

For Model I users with recompiled CP/M, all the locations and calls explained in *Soul of CP/M* would jump to the wrong locations. However, since the Model I system was "moved" up 4200 hexadecimal (hex), adding 4200 to every location and call solves the problem. The short program in Listing 1 works on the Model I in the form shown in Program Listing 2.

As you learn the system calls, add 4200 hex to the entry points. The

```
a4300
4300 mvi c,02
4302 mvi e,38
4304 call 4205
4307 mvi c,02
4309 mvi e,30
430B call 4205
430E jmp 4300
```

Program Listing 2. Listing 1 for the Model I.

sample programs in the text work just as if they were calling the traditional CP/M locations.

Chapter 3 looks into more advanced nondisk system calls and has you write programs inputting data and outputting to both the screen and printer.

Chapter 4 introduces the ASM (assembler). By this time, you're quite comfortable with Assembly language and BDOS routines, so the move to assembling is painless. Assembly syntax and the ORG directive bridge the gap between using DDT and fully assembling programs.

Chapters 5 and 6 detail system calls for opening and writing to disk files, both sequential and random. Because of the powers of DDT, learning how CP/M handles disk routines is relatively easy.

Chapter 7 discusses the file and directory structure, explaining how to retrieve erased files and use wildcards. Stack management and the system bit map are discussed and illustrated in programs.

For those having withdrawal pains from Basic, the eighth chapter deals with merging Basic and Assembly-language programs. The authors cover the subjects of locating Assembly-language programs, passing parameters between Basic and Assembly language, and automatically POKEing hex files for use by Basic programs.

For the truly adventurous, the final

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chapter deals with modifying the CP/M Basic Input/Output System (BIOS) itself for special printer configurations or other tasks. Performing major surgery deep in the heart (or soul) of CP/M is remarkably easy.

The book ends with several useful appendices detailing hexadecimal notation, 8080 instructions, CP/M system calls, and a summary of DDT commands.

Soul of CP/M does have some limitations. It isn't a general Assembly lan-

guage text. Because of its focus on CP/M system calls, you can't automatically run sample programs on a standard Radio Shack computer even if the 8080 and Z80 instructions are compatible.

Since MS-DOS (for 16-bit systems) uses similar system calls, however, the basic theory works if you make changes in the instructions themselves.

If you're using CP/M and wish to learn about its heart and soul, this book is for you. ■

ready to run command files.

The balance of the 8½- by 11-inch manual is approximately 150 pages long, generalized for all versions of the software. Therefore, this includes functions not available for the Model II.

It's well organized, nicely spaced, easy to read, and written in reasonably concise, plain English. I was disappointed by the number of typographical errors that are cosmetic distractions. The table of contents is adequate and the helpful index contains references to all commands in visual and command modes.

Appendix A's details for customization are useful and informative, and follow the sequence of menus you encounter in setting up your personalized editor.

Other appendices contain a help list with explanations of all editing commands, an expanded description of error messages to help you interpret cryptic messages or recover from error conditions, and a reference to two limitations (bugs) in VEDIT.

To handle lines exceeding 258 characters, you need a customized version of VEDIT that you can obtain from Compuvue. This shouldn't be a problem under normal circumstances.

The second bug occurs if you try to read a file originated with a word processor, such as WordStar, that sets bit 7 of some characters. You're likely to see a messy display of inverse video and strange characters, and you won't be able to process the file properly with VEDIT.

Conversely, formatted files produced with VEDIT end lines with hard carriage returns like the nondocument WordStar mode and might require considerable editing for satisfactory printout with a WordStar type word processor.

Manual contents are arranged in a friendly and efficient manner. An initial brief overview introduces beginning word processing and visual and command modes.

A tutorial with graphics aids gives sequential steps for use of each visual mode function key and some of the command mode functions you're most likely to use while editing. A quick reference to the appropriate page of this section tells you what you need to know to use each feature.

The next chapter offers more descriptive information for the visual mode. A

★★★★½

VEDIT 1.15e

Compuvue Products Inc.

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Model II, CP/M

\$150

by Charles R. Perelman

VEDIT is a full-screen text and program editor that offers you complete keyboard customization and lets you tailor other editing operations to your liking. It's easy to operate, of good quality, and flexible. VEDIT offers many word processing features and responds to your commands quickly.

Produced in various formats for CP/M, CP/M 86, and MS-DOS, VEDIT for the Model II has two ready to run versions, one for Pickles & Trout CP/M and the other for all other Model II CP/Ms.

You can develop your own customized editor with a menu-driven program covering keyboard layout, use of special characters, a wide range of formatting and operational controls, screen parameters, buffer size, and sign-on message.

The beauty of setting up your own keyboard is that you can duplicate commands you've learned for word processing or with another editor for controlling cursor movement and other functions.

You can implement alternate keys for a command. For example, on the Model II you can use the arrow keys and the control key with your favorite letters or numbers for four-way cursor movement.

As soon as you install the familiar controls, you can use the visual mode of the editor without constant reference to the manual. Learning time to use

VEDIT with reasonable speed is minimal.

If you consistently need a particular format or want to implement specific cursor, tab, indent, and similar parameters through use of extended commands, place this information in a special file with INI as an extension. VEDIT calls them automatically on start-up.

In addition to a wide variety of commands for full cursor movement about the screen, to beginning or end of words or paragraphs, for next page or prior page, and to the beginning and end of the text buffer, visual mode includes most basic word processing functions. You can delete characters, the next word, a prior word, the end of a line, or an entire line.

You can also insert, automatically indent, set the right margin, word wrap, format paragraphs, and set text markers. The Undo key is a neat facility that restores a line altered by insertion or deletion (except where you deleted the entire line) prior to additional cursor movement.

You can use 10 text registers for cut and paste operations and VEDIT prints any part of a file. These impressive features give VEDIT a great deal of flexibility. You can painlessly extract from other files or programs for insertion into your current project.

You essentially get screen display on the printer, although you can embed control codes or nonprinting lines for a formatting program.

VEDIT's documentation is a pleasure. A four-page supplement for Model II owners describes the specific installation files, critical customization information, and sample customizations for keyboard and other parameters that coincide with the furnished,

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fairly involved discussion of command mode usage precedes an expanded version of the reference list of commands in Appendix B. This section concludes with reference manual type descriptions, examples (some of which are complex), and comments for each editor command.

The manual is easy to use and quite complete in its coverage. A cardboard Help sheet with editor commands on one side and spaces for keyboard controls on the other, or a Help screen with this information, would be welcome additions.

Using VEDIT

If you've used the CP/M editor ED, you'll feel comfortable with the VEDIT command mode. Most of the same commands perform simple functions, and they generally operate identically. VEDIT goes beyond ED with numerous improvements and an entire series of extended two-letter commands that begin with E and two-letter register commands that begin with R.

Since it's easier to perform common editing functions in the visual mode with control keys, you use editing commands primarily with execution of macros, search and replace functions (a full repertoire including wildcard characters), and beginning and ending edits.

You use extended commands for program parameters that you set once and then forget at the beginning of each new session. Register commands let you accomplish all kinds of multiple file inserts and concatenations.

Perhaps the most outstanding improvement to ED is the powerful command macro function. You create complex combination commands to perform sophisticated search and replace, to set up formats for a file automatically, and to edit multiple files.

For repetitive edit functions or formats, you save a great deal of time by writing and saving a library of macros on disk that you implement for future edit sessions by calling the file name.

Manipulation of 10 text buffers gives VEDIT substantial clout. You can take data from several files and store it in the registers to append to or insert into the current program.

Put previously defined macro files into registers or store macros defined for the present edit in text registers for later use. Calling the register executes the macro. Any buffer is immediately available for readout to the screen or printer

whether it contains text or a macro.

Screen action with VEDIT is noticeably more rapid than with WordStar and similar programs. VEDIT automatically buffers large files to and from disk. The automatic indent feature and insertion capabilities are useful in pulling

"Screen action with VEDIT is noticeably more rapid than with WordStar and similar programs."

previously written routines into a new program and maintaining a structured outline or indented program format.

When you use the paragraph format function on the last paragraph of the current text, VEDIT has a nasty habit of scrolling all the text off the screen. You are left with a cursor descended several lines into a blank screen.

For further editing, you must use a command to recall the prior page or paragraph, neither of which returns the cursor to the end of the file or the spot from which you started formatting. A similar fate awaits when your ZEND function key flips you to the end of the file.

Unfortunately, the repeat key function that permits repetition of given procedures a specific number of times from the visual mode doesn't work with

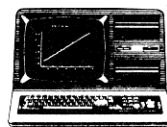
the Model II. You can use the repeat key on the Model II with keyboard commands if you have sufficient digital dexterity to reach all the necessary keys concurrently.

Disk Full error messages can make a user weep, particularly since they always occur after two hours of impossible editing and with an impending deadline. VEDIT treats these problems like a champ, letting you close part of the file on your current disk and insert another disk for saving the balance. All screen editors and word processors should have this capability.

If you save your revised file with the original file name, VEDIT designates the old file a .BAK file. Disk directories are accessible without leaving VEDIT, which facilitates working with other files on the same disk. With all these abilities, the VEDIT com file is packed into only 14K.

Compuview offers an interesting technical support option that they claim is elected by nearly 40 percent of VEDIT purchasers. For \$50, you receive two new releases of VEDIT approximately six months apart as they continue to upgrade the software.

If you like to patch together programs and text from data in several other files, and want to minimize the time required to become acquainted with a new tool's commands, get VEDIT and customize the visual mode controls to the sequence you already know or the one you've always wanted to use. ■



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by Jim Heid

Using TRSDOS 6.0 is a perfect example of how not to produce a videotape instruction course. This two-hour tutorial on the disk operating system for the TRS-80 Model 4 is poorly recorded, poorly narrated, and neglects to exploit the potential of video instruction.

The Video

The video portion of *Using TRSDOS 6.0* consists of a shot of a Model 4's screen—nothing else. The most action

you'll see is a flashing cursor. No shots show the beginner how to turn on the computer, how to insert a disk, or how to boot the system.

"Using TRSDOS 6.0 is a perfect example of how not to produce a videotape instruction course."

The video doesn't use superimposed titles explaining a command's syntax. Even when *Using TRSDOS 6.0* explains a command that uses a printer, the camera remains trained on the video screen.

Worse yet, the camera doesn't show the whole screen at once. When a display fills the screen, the camera pans

slowly from left to right.

The Audio

The audio portion of *Using TRSDOS 6.0* is worse. The sound quality is poor, with lots of popping P's and an overall tinny sound.

The narrator speaks in a monotone throughout. She goes from one command to the next without the slightest pause or change in inflection.

Her delivery is inconsistent, too. Sometimes she pauses for several seconds for no reason; other times she races along.

The audio and video aren't perfectly synchronized, either. Sometimes the narrator starts on a new command while the screen still displays the results of the previous one.

The information presented in *Using TRSDOS 6.0* is accurate, but it isn't geared toward the type of person who would need a video instruction course—the beginner.

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length, and parameter are tossed around without a single definition. Much of the script is awkwardly written and filled with run-on sentences delivered at breakneck speed.

Summary

Video is a powerful instructional

medium, but the producers of *Using TRSDOS 6.0* miss the boat. They try to stuff too much information into the tape. It takes lots of experimentation and reading to fully exploit the power of TRSDOS 6.0. It cannot be taught (or learned) in two hours.

Using TRSDOS 6.0 doesn't tell you

anything that isn't covered in the manual. If you want to learn to use TRSDOS 6.0, get a couple of blank disks, sit down at the computer, open the manual, and try each library command, experimenting as you go. You'll learn TRSDOS and you won't spend \$39.95. ■

★★★★½

Datagraph

Models I, II, III, 12, and 16, LNW-80 48K, two disk drives suggested

Printer

\$79.95

★★★

Pie Chart Option

\$34.95

Micro Software Systems

Microplot Inc.

1815 Smokewood Ave.

Fullerton, CA 92631

by Thomas L. Quindry

Datagraph is a Model I/II/III graphing program that lets you generate high-resolution dot-matrix graphs and plots with specified printers (listed in Micro Software Systems' advertisements). You can also produce pie plots with the pie chart option.

Overall, Datagraph is a worthwhile program. It's versatile and easy to use, and it generates professional quality graphs.

The program does have some drawbacks, however. At times, it generates unnecessary line feed commands, an annoying inconvenience. Also, it always prints the name of the file from which the program draws data on the graph, a feature that should be optional.

System Configuration

For this review, I used the Epson MX-80, MX-100 version of Datagraph with my MX-80-compatible printer. Check with Micro Software Systems to choose the right version if your printer is not listed. More than 14 versions are available for different computer configurations.

Datagraph uses data that you've saved in a VisiCalc Data Interchange Format (DIF) file. If you don't have VisiCalc

and are a fairly good programmer, you can create a Basic program that saves data in DIF format to use with this plotting program.

The Basics

Datagraph is a hybrid Basic and machine-language program. It lets you plot up to 1,000 data points on a graph. You can combine linear plots, staircase plots, bar graphs, and relative bar graphs on the same graph (see Figs. 1 and 2).

Datagraph's linear plots can incorporate a curve-fitting enhancement that provides more plotting points than the straight-line connection between points you get with conventional linear plots. You can specify the number of points the program interpolates between data points. You also have the option of adding customized labels for the horizontal and vertical axes (see Fig. 2).

"Datagraph lets you plot up to 1,000 data points on a graph."

You can plot graphs in any size from 1 inch by 1 inch to 7 inches by 24 inches. The smaller sizes are limited only by the number of horizontal and vertical divisions you specify.

A key describing the data set and line type or symbol appears at the top of the graph if you name your data set. This lets you draw unnamed reference lines on the graph that don't show on the data key.

You can suppress the grid within the graph if you prefer. This is most useful with bar graphs. Grid lines are solid lines, not dotted.

The program has an auto-scaling function that sets the minimum and maximum values and increments of the X and Y axes. It uses a data statement

within the Basic program to provide rounded scale increments that are easy to determine and are divisible numerical values. This gives you easy-to-read graphs.

You can change the values in this data statement to suit special situations. In addition to auto-scaling, you can specify the minimum and maximum values of X and Y for a graph. This overrides the auto-scaling feature for setting these values if the graph meets certain conditions. The manual describes the reasoning behind this and the procedure in great detail.

Using Datagraph

First, the data you use must be in a DIF format to generate the information you want plotted. I'll assume you're using VisiCalc for this procedure. This is strictly a tabular operation where the program lists information on the electronic spreadsheet in column or row orientation.

The only restriction is that the X and Y coordinates of each curve you want plotted have a one-to-one correspondence (i.e., they must be aligned and parallel to each other on the worksheet). If the X and Y data are distributed along rows, the corresponding values must be in the same column. If column distribution is used, they must be in the same row.

For plotting purposes, the program considers Y the dependent variable and X the independent variable. Plots that contain several curves can use either the same set of X values for plotting or a different set of X values. Thus, one curve can have more plotting points than another. Standard increments between points are unnecessary.

You should also place any specialized horizontal or vertical scale labels on the worksheet at this time. You can use only one set of vertical scale labels, but you can use as many horizontal scale labels as you wish. You can place any other extraneous information you want on

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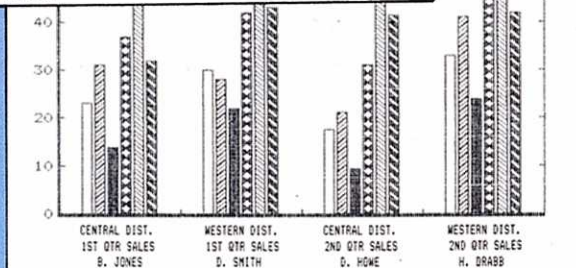
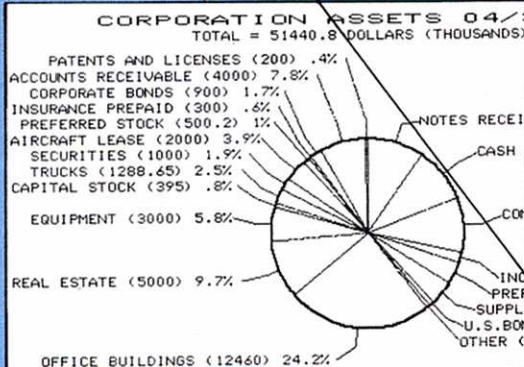
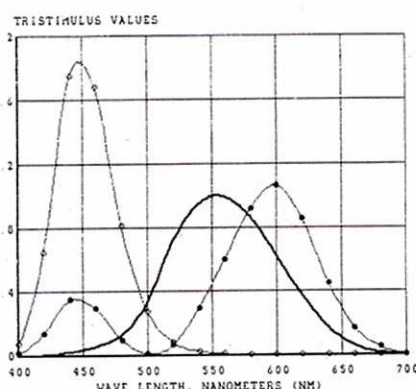
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1202	78.26	972.76	421.43	115.12	136.74	1062	495	17,275	8,455	
105	78.08	972.52	435.77	117.81	137.97	1024	433	11,150	14,669	
104	79.14	964.69	402.89	117.16	138.12	1049	640	38,463	23,709	
107	77.29	980.59	391.19	115.19	135.08	216	1555	5,969	85,844	
109	76.20	945.70	385.24	114.07	133.06	578	1028	11,759	39,075	
109	76.44	948.69	384.82	112.89	133.48	907	620	28,933	15,739	
112	76.52	948.77	388.34	112.85	133.52	928	633	23,813	19,192	
113	76.35	945.10	387.18	112.49	133.27	578	993	12,407	24,532	
114	76.55	946.47	389.55	112.38	133.47	914	612	23,382	13,773	
115	76.99	949.77	376.10	112.60	134.22	789	691	21,567	13,526	
116	77.33	973.29	401.99	113.22	134.77	690	642	23,22	14,425	
119	77.10	970.79	403.55	114.35	134.37	740	750	16,154	15,338	
120	75.84	950.68	394.89	113.80	131.45	371	1172	5,359		
121	75.39	946.25	392.44	113.80	131.35	547	554	15,787		
122	74.76	940.44	392.03	113.00	130.26	461	1024	11,057		
123	74.72	940.19	391.61	111.76	130.23	683	780	16,604		
124	74.45	938.01	389.19	111.47	129.64	554	898	11,694		
127	75.19	949.48	394.64	111.72	131.12	943	559	28,173		
128	74.78	942.53	395.43	112.49	130.34	636	788	17,433		
129	74.69	948.09	398.04	112.74	130.24	774	710	19,435		
130	74.27	947.27	402.22	112.82	129.55	727	776	16,777		

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the spreadsheet. Not all the information on the spreadsheet must appear on the resulting graph.

After you include all plotting information on the spreadsheet, you must save it in the DIF format. The VisiCalc manual explains this procedure.

Next the VisiCalc spreadsheet generates a table that provides specifications for Datagraph on how and what to plot. Datagraph produces a file called Form/DIF that provides a ready-made table. All you do is fill in the blanks on this table and save it in DIF format.

This form includes places to enter the graph title, data file you want used, date, vertical and horizontal labels, size of graph, divisions, minimum and maximum scale dimensions (optional), data descriptions, location of data descriptions on the data file (rows and columns), and line type desired.

A feature for the horizontal division specification is selection of a calendar scale. If specified, the months appear in place of the numbers 1-12 on the bottom scale. For numbers greater than 12, the remainder after subtraction of multiples of 12 determines the month.

The most powerful control on the forms page is the line type specification. You choose one of 12 different line types from a symbol table.

Each line type specifies a symbol used for data points, the maximum number of interpolation points, and the symbol used for interpolated points. This is a straight-line interpolation unless you specify the curve-fitting option.

You can generate your own line types and symbols and save them in this file. However, doing so destroys the file supplied with the Datagraph program. You can manually restore the original line types by copying the symbol and other information from the Datagraph manual.

It would have been much easier to create separate symbol files. One more entry on Form/DIF could indicate which file to use.

Use the line type specification on the Form/DIF sheet to specify the type of graph you're plotting. Just giving a number gives you a linear plot. The letter C followed by a number before the line type specification invokes the curve-fitting routine for the number of interpolation points you specify.

The letter S gives you a stairstep graph. The letters B and R produce bar

graphs and relative bar graphs, respectively.

A relative bar graph plots the bar between two points using two sets of data for the Y scale. For both types of bar graphs, you must also specify the relative offset in the horizontal direction. This lets you determine the order in which multiple bar graphs appear on the graph.

The letters V or H specify vertical or horizontal labels to replace the numerical label that normally appears. You

can center horizontal labels on a grid line or between grid lines.

You can also print the horizontal label in regular or condensed mode. If you specify regular mode when you have insufficient space, the program uses the condensed mode. If you don't have enough room for the condensed mode label, an error message appears before plotting commences.

Pie Charts

The letter P generates pie charts. The

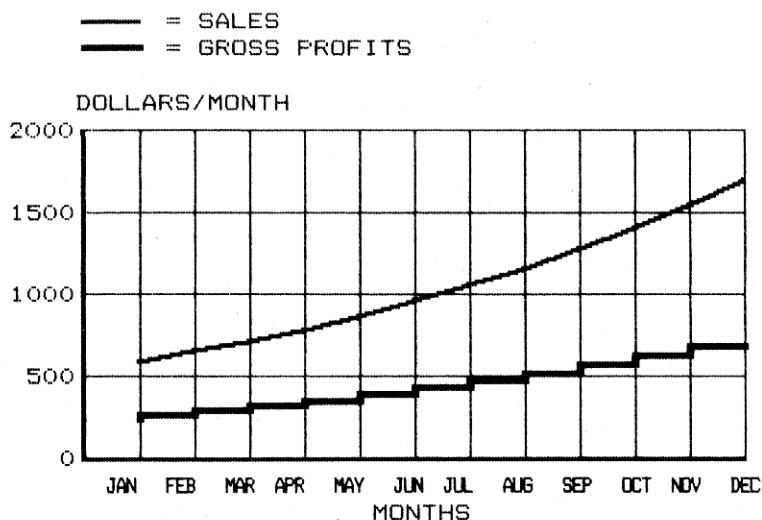


Figure 1. Linear and stairstep plots with calendar label option.

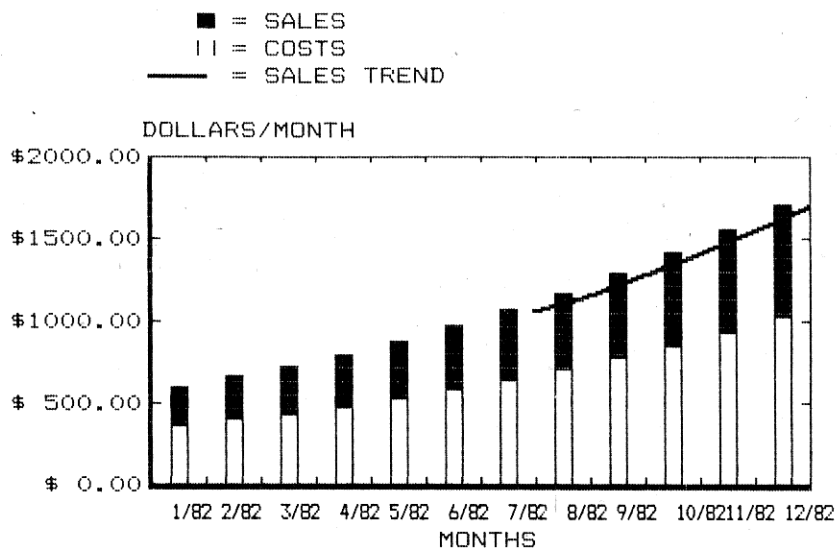


Figure 2. Bar graphs and relative bar graphs combine with a linear plot.

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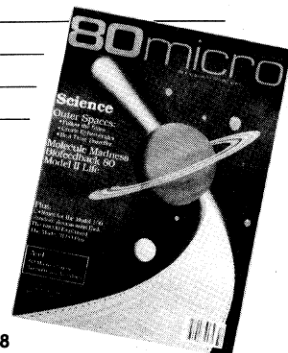
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Pie Chart Option costs an additional \$34.95. You can specify different line types for the pie diameter and dividing spokes. Pie charts can be anywhere from 1 inch to 3 inches in diameter.

The same Form/DIF format specifies the information for pie charts. You don't need all the information requested and you should change some of the labels on the Form/DIF spreadsheet form. I made up a Pieform/DIF spreadsheet by making label changes to Form/DIF.

You need two entries for each pie

chart data point: a label entry and a data entry. The main fault I found with pie chart generation is that you have limited space for pie chart labels. If a label is too long, the program truncates it. As few as five characters or as many as 22 characters are available for your label depending on the segment's location on the pie and the pie's size.

All segments of the pie are white. No cross hatching or coloring of segments is possible. I am still impressed with the program, though; the Pie Chart Option is useful.

Problems and Praise

Two annoying conditions exist in Datagraph. First, you must turn on the printer when using the program, so printer initialization results in a line feed. When you go to VisiCalc, another printer initialization to different conditions sends another line feed command. Your page gradually creeps up.

The second problem is the label giving the graph file and date that appears in the upper right corner of the print-out. The program contains a method for suppressing the date but not the graph file. This is relatively easy to change since the label is printed from the Basic program.

The Datagraph manual is difficult to read because of the many enhancements made to the original program. Rather than upgrade its manual, Micro Software Systems has taken the more expedient route of adding sections describing the enhancements.

Thus, some information you read early in the manual is corrected later. It would be more prudent for Micro Software Systems to rewrite their manual than to confuse the user.

Other than the contradictions, the manual does explain what is happening and what to expect. The only confusion I experienced was in using horizontal labels.

When centering labels between grid marks, you must specify an extra label entry. Also, when using numeric labels, you must be sure that VisiCalc specifies a label rather than a value. The manual does not explain these two points.

One serious limitation I see for business graphics is Datagraph's inability to plot logarithms. You can fool the program into producing log plots, but it's no easy task.

Micro Software Systems has done a fine job in programming Datagraph. It is surprisingly quick in generating graphs, and it contains a good selection of error messages. A repeat feature lets you plot as many copies of a graph as you wish. Color plotting is also quite impressive.

The pattern that Micro Software Systems seems to be following is continual upgrade of Datagraph with a corresponding increase in price. The best enhancement they could make is to free the user from having to purchase VisiCalc. ■

C. ITOH

Prowriter



C. Itoh's venerable **Prowriter** has speed (120 cps), a buffer (1.5K), 10, 12, & 16 cpi (plus a proportional font with correspondence quality) and dot graphics (160x144 dpi). The **Prowriter 2** is the 136 column version. **Prowriter** \$399.88 **Prowriter 2** \$719.88

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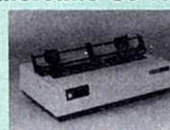
Gemini 10X/15 Delta 10/15



The **Gemini 10X** features 120 cps, 10, 12, 17 cpi, italics, a correspondence font, dot graphics & a 1K buffer. Friction/tractor feed. Use plain spool ribbons. The **Gemini 15** is the 132 column version. The **Delta 10** has all the features above plus parallel & serial interfaces, 160 cps print speed, an 8K buffer. The **Delta 15** is the 136 column version. **Gemini 10X**.....\$309.88 **Gemini 15**.....\$459.88 **Delta 10**.....\$529.88 **Delta 15**.....\$CALL

OKIDATA

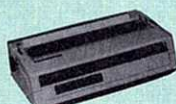
Microline Series



The **Microline 92** (80 col) & **93** (132 col) are ideal for word processing. They offer a 160 cps draft mode, a 40 cps correspondence mode, 10, 12 & 17 cpi (w/double-width), pin/friction feed (tractor is optional on the **92**) &

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EXP-550 (Parallel).....\$599.88 **EXP-550** (RS-232C).....\$699.88 **EXP-500** (Parallel).....\$499.88 **EXP-500** (RS-232C).....\$599.88 **EXP-500** Tractor.....\$599.88

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FX, RX & MX

The **FX-80** (160 cps) has a correspondence font, 10, 12 & 17 cpi, italics, double-strike/width/emphasis, etc. dot graphics, friction/pin feed (the adjustable tractor is optional) & a 2K buffer. The **FX-100** is the 136 column version. The **RX Series** replaces the MX, & offers 100 cps print speeds, but nothing more remarkable. Epson.....\$CALL

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Letter-Quality Printers

C. ITOH

Starwriter



The C. Itoh **Starwriter** offers top speed (40 cps) at a good price.

Starwriters use Diablo code, wheels & ribbons, 1/48" line space, 1/120" horizontal spacing. For high speed output, there's the **Printmaster**, at 55 cps. Same specs as above. A new printer, the **A10 Starwriter**, features the same specifications, but at 18 cps. **A10 Starwriter**.....\$609.88 **F10 Starwriter**.....\$1219.88 **F10 Printmaster**.....\$1589.88 **F10 Tractor Feed**.....\$289.88 **F10 Sheet Feeder**.....\$609.88

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REVIEW DIGEST

Home Accountant, Continental Software, 11223 Hindry Ave., Los Angeles, CA 90045, Models I and III, \$49.95.

"For a reasonable price, this system keeps track of all monthly income and outgo, reconciles bank statements, prints out personal balance sheets and net-worth statements, allows custom search-and-retrieval of any particular transaction, creates professional-looking graphs of your own financial picture and, on some computers, can provide forecasting. It is an accessible, easy-to-learn system that, even on first use, will give anyone a real sense that they are gaining additional knowledge and control of their financial situation." *Personal Software*, November, p. 123.

Electric Webster, Cornucopia Software, P.O. Box 5028, Walnut Creek, CA 94596, Models I and III, \$149.95.

"...After looking at nine proof-reading programs, I have settled on Webster to keep my final copies accurate..."

"...if English 101 is where you caught up on your sleep, then you will appreciate the grammar option."

"Writers...will find the automatic hyphenation a big help; and if

your spelling is less than perfect or if you have ever missed a typo, then you will love this fast and accurate dictionary program." *Creative Computing*, November, p. 108.

TRS-80 Model 4, Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102, \$1,999.

"The design of Radio Shack's new TRS-80 Model 4 computer is proof that large corporations can be responsive to the needs of their customers. An enhanced version of the popular TRS-80 Model III, its new features read like a Model III owner's wish list.

"...Given all the new features in the TRS-80 Model 4 and a price that's lower than its predecessor, the popular Model III, it's safe to say that Radio Shack has a guaranteed winner." *Byte*, October, p. 292.

Disk Trendex Stock Market Trend Analysis, Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102, Models I and III, \$49.95.

"...This...program provides solidly based statistical analysis of the stock market and of your own portfolio without all the confusion traditionally found in technical analysis software.

"...these programs...are based

upon solid statistical methods used every day by stock market professionals to identify market trends." *Personal Computing*, November, p. 196.

6.0 Plus, Micro-Systems Software Inc., 4301-18 Oak Circle, Boca Raton, FL 33431, Model 4, \$49.95.

"6.0 PLUS takes TRSDOS 6.0 to new heights of utility and versatility. It may very well become the de facto standard utility package for TRSDOS 6.0, at least until the competition catches up." *Basic Computing*, October, p. 79.

Lynn Video Instruction Series: DB-1 Using Profile III+, Lynn Computer Service, 6831 West 157th St., Tinley Park, IL 60477, VHS or Beta Format, \$39.95.

"I found the material to be carefully developed and quite appropriate. They carefully covered all options of the software and even gave some tips that are not in the Profile III+ manual. Much is covered, and more than one viewing is recommended. It does get boring, but a fast-forward button on the VCR will quickly get you to the material that needs a second look." *Basic Computing*, October, p. 83.

CHILD'S PLAY

AN EDUCATIONAL PROGRAM FOR CHILDREN AGES 2 TO 7 YEARS



This machine language program contains fast **animation**, **sound effects**, **tunes**, and **speech**. The speech has two options: it can be generated by computer or by a VS100 speech synthesizer (speech options described later). The program is easily controlled by a friendly menu-man who points to the options that may be chosen. The main menu contains four sections: • **Learn the Alphabet** • **Learn to Count** • **Learn Shapes** • **Learn Words**. Each section contains three subsections which can easily be manipulated, giving twelve games in all. The menu selection is accompanied by a different nursery rhyme tune for each menu.

LETTERS

This option allows the child to select letters at random, match the current letter displayed, or type in the next letter. When a correct response is given, an animation associated with the letter moves across the screen, e.g., Z for Zebra. The computer says the letters also.

NUMBERS

This option allows the child to select the numbers zero to nine at random, match the current number displayed, or type in the next number. Men walk out on the screen equal to the number chosen. This section also contains speech.

SHAPES

This section allows the child to control the menu-man, moving shapes from the left hand of the screen to the right hand of the screen. The first level allows the child to pick up shapes using the spacebar. The second level, in addition, allows the child to control the menu-man with the arrow keys. The third level puts a small 'Bee' on the screen which the child must avoid while manipulating the menu-man and shapes.

WORDS

This final section allows the child to type in letters to form words. The first level asks for a word to be typed in, then to be repeated before another word can be tried. The second level

prompts the child with a word which must be matched before an animation will appear on the screen. The last level shows the animation on the screen. Then the child must type in the correct word before the next animation is shown. This section contains speech also.

SPEECH

The program can be bought as a stand-alone program with computer-generated speech, which uses 'your' speaker amplifier. However, we have also made the program compatible with an 'Alpha Products VS100' speech synthesizer for improved speech quality. (This can be purchased from 'Alpha Products' subject to availability). The speech is not available for a 16K machine.

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Tandy

Makes Its Move

by Eric Maloney

For a year now, the TRS-80 world has nervously watched a convoy of computers swing into the fast lane and pass by in a cloud of dust. When, the faithful asked, would Tandy bring out a machine that could compete with the heavy metal taking over the road?

Well, wait no more—the Model 2000 is here. It is unlike anything Tandy has ever produced. And if it lives up to its advance notices, the 2000 will erase all doubts that Tandy is ready to meet the challenge of its super-charged competitors.

The phrase some Tandy executives are using to describe the machine is “ultra-high performance.” The specifications speak for themselves (see Table 1).

The 2000 uses the 16-bit 80186 microprocessor from Intel Corp. and operates under MS-DOS from Microsoft. It comes with 128K RAM, expandable to a whopping 768K. Two disk drives are standard, with 720K storage per drive (that’s about 1.4 Mbytes on two floppies). And it runs at a

*The 16-bit Model 2000,
with MS-DOS and hi-res
color graphics, is Fort Worth’s bid
to move into the mainstream
and take on the Boys in Blue.*

breakneck speed of 8 MHz.

But wait—there’s more. The Model 2000 is capable of 640-by 400-pixel high-resolution color graphics. In hi-res mode, you can display up to eight colors, choosing from a palette of 15. You can also create monochrome graphics. With either the color or mono screen, you

have an 80- or 40-character by 25-line display.

Then there’s the software. Tandy will offer some of the most popular MS-DOS-compatible software available, including Microsoft’s Word word processor, Software Systems’ MultiMate word processor, dBase II from Ashton-Tate, Microsoft’s Multiplan spreadsheet, and the complete PFS business package. In addition, the company will sell a line of MAI/Basic Four accounting software packages, until now available only on the Basic Four minicomputers.

The price? The base unit without the monitor goes for \$2,750 (\$4,250 with the optional 10 Mbyte hard drive), and \$4,197 with the color monitor and graphics capability. Expanding internal memory to the full 768K costs an additional \$1,895. So a complete system, minus the TV/joystick option and the monochrome monitor, will go for around \$6,500 (see Table 2 for the price list).

Editor’s note: This article is not a review, since a review unit was not available at press time. It is based on a demonstration of the Model 2000 and material provided by Tandy.



What's So Different About the 2000?

Nearly every step of the way, the Model 2000 offers something new:

The 80186. The 2000 is one of the first micros to use the 80186 microprocessor. It is, unlike the IBM PC's 8088, a true 16-bit microprocessor, with a 16-bit bus. At 8 MHz, it is significantly faster than the IBM (4.7 MHz) or Tandy's other 16-bit machine, the Model 16 (6 MHz). Tandy says that its benchmark tests show the 2000 to be almost three times faster than the IBM. And they say 80186 object code is compatible with the 8086/8088.

User-accessible expansion. Another first for Tandy is the manner in which the 2000 permits expansion: you do it yourself. The main unit comes with four expansion slots in the back. You slide your expansion board into one of the slots like a tray (see Photo 1 and Fig. 1a). Two lock buttons attached to the board hold it in place.

The slots can be used for the following boards:

- Two 128K external memory boards, each expandable to 256K. (The first 128K expansion kit is installed internally.)
- A hi-res monochrome graphics board.
- A TV/joystick board.
- A DigiMouse/clock board (DigiMouse required).

The hi-res color graphics kit includes chips that you or a Computer Center dealer plug in to the hi-res monochrome board.

Mass storage. The drives are double-sided, double-density thin-lines, formatted 96 tracks per inch. The 720K storage per disk is four and one-half times greater than the Model 4's.

Three graphics options. The 2000 supports medium-resolution color graphics,

hi-res color graphics, and hi-res monochrome graphics.

The medium-res option requires that you have a color television and the TV/joystick expansion board, and gives you 320- by 200-pixel graphics. You can use four of 15 colors at one time.

The hi-res color option requires the CM-1 color monitor, the monochrome graphics option board, and the color graphics option kit. Resolution is 640 by 400 pixels, and you can use up to eight colors (see Photos 2 and 3).

Available colors are black, blue, green, cyan, red, magenta, brown, gray, light blue, light green, light cyan, light red, light magenta, yellow, and white.

The hi-res monochrome option requires the monochrome graphics option board and either the VM-1 monochrome monitor or the CM-1 color monitor. Resolution is 640 by 400 pixels (see Photo 4). You have two shades of white (normal and high-intensity), and you can create reverse-image, invisible, highlighted, and underscored characters.

The keyboard. The keyboard layout is shown in Photo 5. The 12 function keys are programmable, and the caps and number lock keys have indicator lights. The print key prints each character as displayed, while shift/print prints the current screen. The character keyboard is tiered, while the numeric pad is flat for easier use.

The name. Perhaps one of the most telltale changes is one of the most minor: the name. If you look closely at the front of the main unit, you'll notice that the machine is called the Tandy Model 2000 Personal Computer. "Radio Shack" has been dropped from the label. This is, more than anything else, an indication of how much Tandy wants to alter its image of a company that makes computers for hobbyists instead of serious businessmen.

What's It Look Like?

In keeping with the Models 4, 4P, and 12, the Model 2000 has a textured white case. The main unit includes the CPU, the two drives, and the expansion slots, with the power and reset switches mounted on the unit's front (see Fig. 1 for diagrams).

The Model 2000 in a Nutshell

CPU	16-bit Intel 80186
Internal memory (standard)	128K
Internal memory (maximum)	768K
Disk drives	2
Disk storage per drive	720K
Speed	8 MHz
Operating system	MS-DOS 2.0
Expansion slots	4, user-accessible
Graphics options:	
Medium-res color	320 × 200 4 colors
Hi-res color	640 × 400 8 colors
Hi-res mono	640 × 400
Video display (color)	14", 80/40 × 25
Video display (mono)	12", 80/40 × 25
External connections	RS-232 Parallel port AC outlet Mono monitor connector
Options	Hi-res mono monitor Hi-res mono graphics Hi-res color monitor Hi-res color graphics TV/joystick interface DigiMouse/clock board DigiMouse 10 Mbyte built-in hard disk Monitor pedestal CPU floor stand

Table 1. Model 2000 specifications and options.

Tandy has designed the Model 2000 to be set up in a number of ways. Normally, the monitor rests on the main unit while the keyboard sits in front. The keyboard includes extendable legs to give it more tilt. When not in use, the keyboard slides under the main unit.

But if you buy the optional floor stand, you can mount the CPU vertically and set it up to eight feet from the keyboard and monitor. You can also buy a monitor pedestal for the VM-1 that both tilts and swivels. Tandy claims that, with the keyboard in your lap and the CPU on the floor, you reduce the 2000's footprint to about 104 square inches, which is about nine inches more than that of the Model 100 portable.

Now for the Software

All discussions of the Model 2000's software must start with its operating system—MS-DOS 2.0.

Tandy's reason for choosing MS-DOS is simple: It is the DOS of choice for the IBM PC and has spawned a huge software base for MS-DOS machines. Thus, the Model 2000 user has immediate access to a variety of off-the-shelf packages.

One has only to leaf through the IBM or general-interest magazines to get an idea of the software base for MS-DOS. Current manufacturers include MicroPro (WordStar, MailMerge, SpellStar, CalcStar), Ashton-Tate (dBase II, Friday!), IMSI (Bisysbase, Investment Manager, the IMSI Accounting Series), Pearlsoft (Personal Pearl), Sorcim (SuperWriter, SuperCalc), Perfect Software (Perfect Writer, Perfect Calc, Perfect Filer), and, of course, Microsoft. And it's reasonable to expect that, if the Model 2000 takes off, manufacturers of IBM software will adapt their products to the 2000.

Tandy will start users off with several proven software packages. They include:

- Three word processors. At the high end (\$375) is Microsoft's new Multi-Tool Word. The mid-priced model (\$249.95) is MultiMate from Softword Systems, currently being implemented on the IBM PC. At the low end is PFS's PFS:Write, one of four programs included in an integrated package. (PFS:Write and Word were still under development at press time.)

Photo 1. The Model 2000's expansion boards install easily. The board comes mounted on a tray; you slide the tray into an expansion slot at the back of the CPU case. Two lock buttons on either side of the tray hold the board in place.

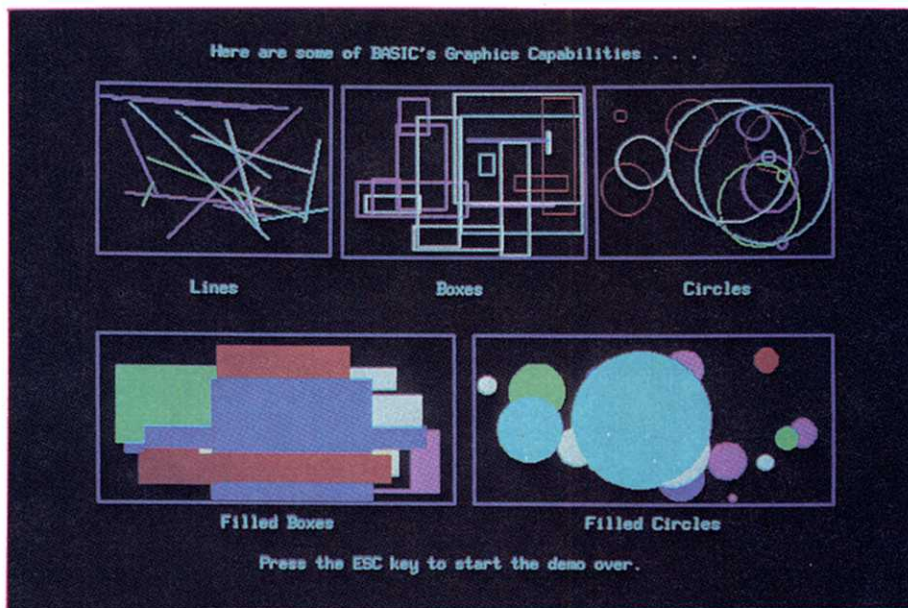
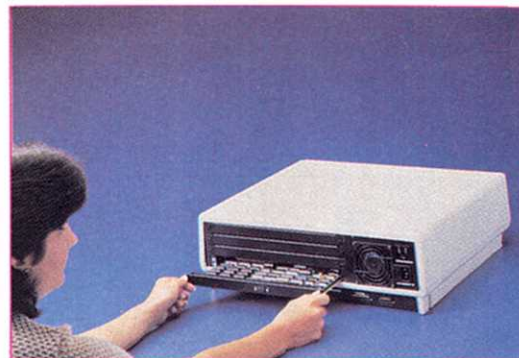


Photo 2. A screen display of the Model 2000's high-resolution color graphics. Shown are geometric patterns developed with GW-Basic.

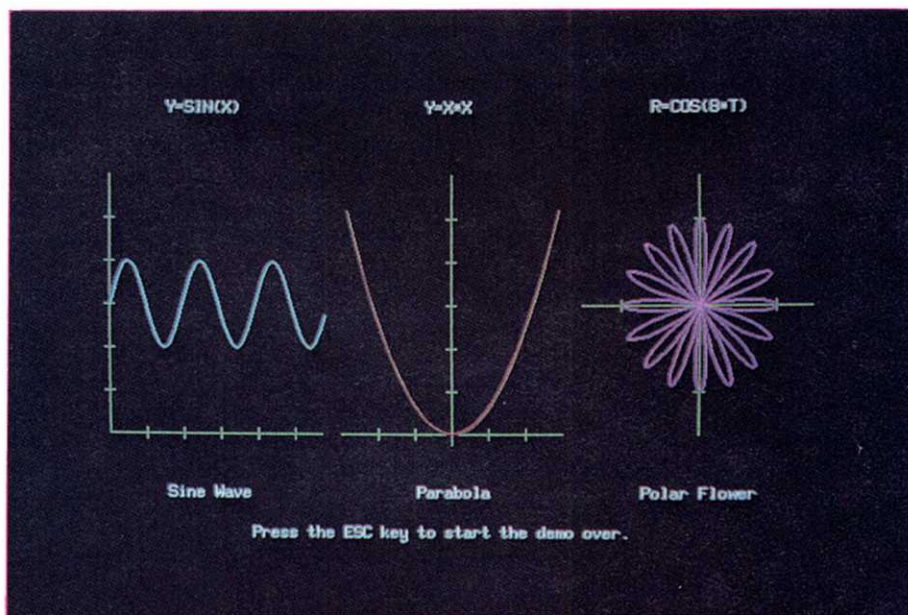
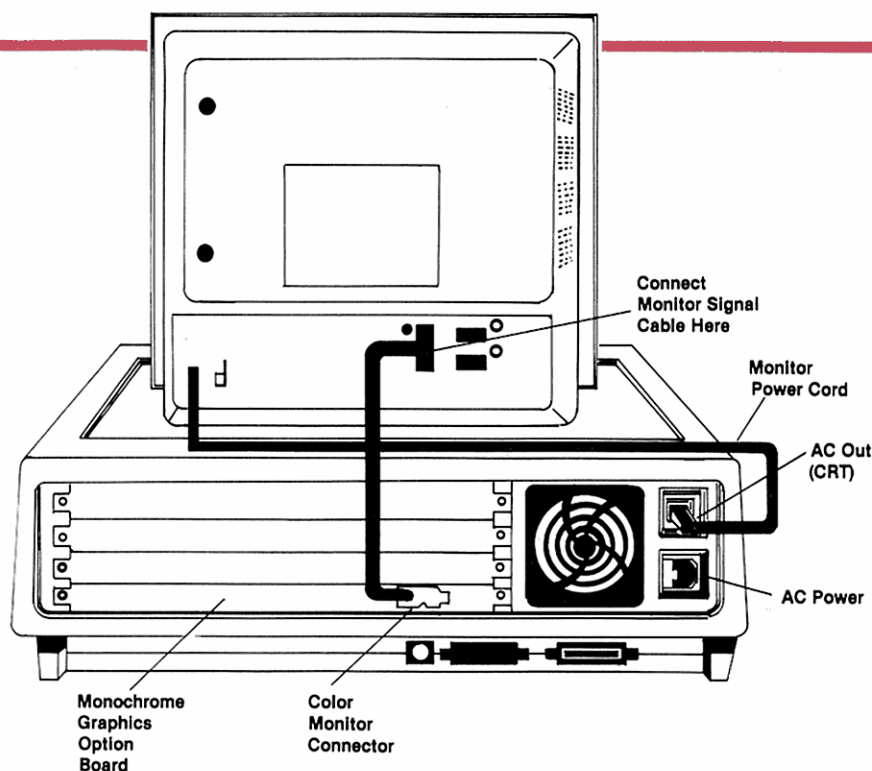
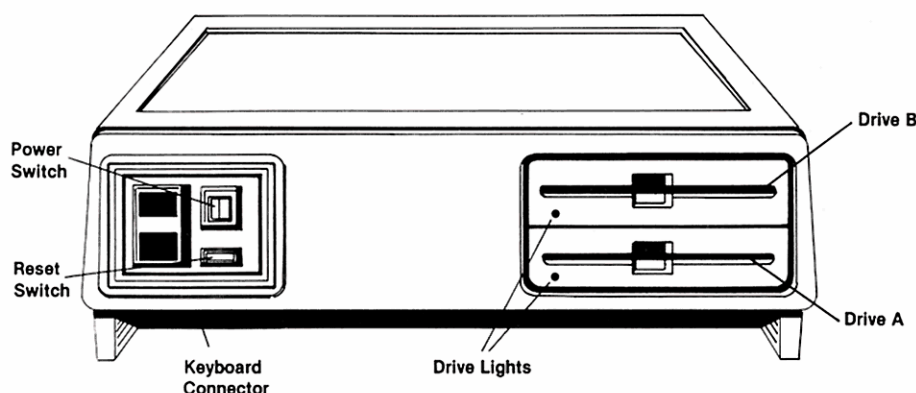


Photo 3. A screen display of mathematical functions.

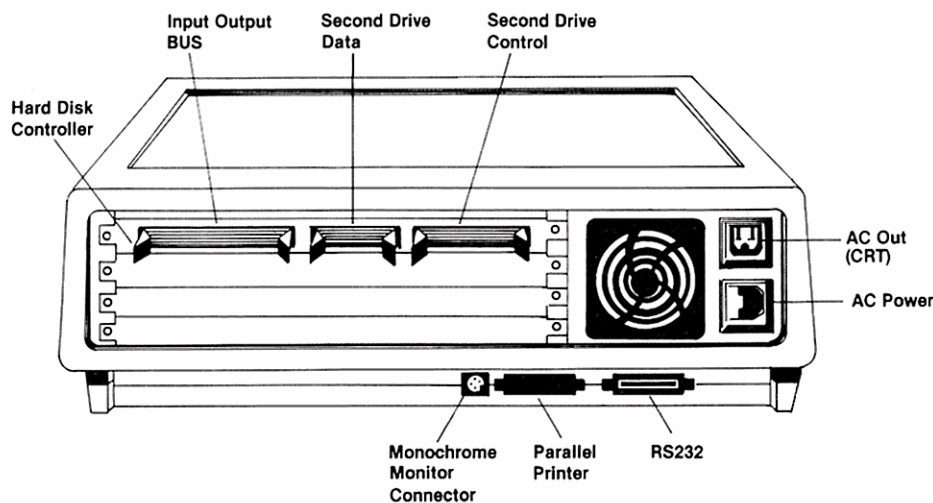
1a



1b



1c



● Three electronic filing packages. Leading the pack at \$595 is the venerable dBase II from Ashton-Tate. Also available are PFS:File (\$140) and PFS:Report (\$125), which work together to store data and create tabular reports.

● Microsoft's Multiplan electronic spreadsheet (\$249).

● Under development is PFS:Graph (\$249), which creates graphs and charts from data stored in PFS:File.

● The MAI/Basic Four small business accounting software. These packages have been converted from Basic Four minicomputers. Included are seven integrated modules: General Ledger (\$495), Accounts Payable (\$495), Accounts Receivable (\$495), Inventory Control (\$495), Order Entry (\$495), Purchase Orders (\$395), and Payroll (\$495). The last four were still under development at press time.

● Videotex Plus (\$49.95), an enhanced version of Tandy's communications package.

● In languages, Tandy will offer the MS-Pascal Compiler (\$299.95), the MS-GW Basic Compiler (\$299.95), MS-Fortran (\$349.95), the MS-Assembler (\$99.95), and Cobol.

How compatible will the Model 2000 be with the IBM PC and MS-DOS? Tandy is quick to emphasize that the 2000 is not an IBM clone. Thus, while it will run some IBM software, those programs that hook into the IBM hardware probably will not be compatible. But the 2000 should run any software written strictly under the conventions of MS-DOS 2.0.

The 2000 comes with GW-Basic, an enhanced version of Microsoft Basic. Its extensive support of color and monochrome graphics includes com-

Figure 1. Model 2000 schematics. (1a): The two-drive Model 2000 as seen from the back, with the color monitor option installed on the monochrome graphics board. (1b): Front view of the CPU case. Note the two thin-line disk drives to the right; in accordance with MS-DOS protocol, the drives are labeled A and B. The keyboard connector and the power and reset switches are to the left. (1c): A second rear view of the CPU case. This unit includes the optional built-in hard disk drive with a single floppy disk drive. The input/output board includes an interface for a second, external, floppy disk drive. Note the built-in monochrome monitor interface and the parallel and RS-232C interfaces along the bottom of the case.

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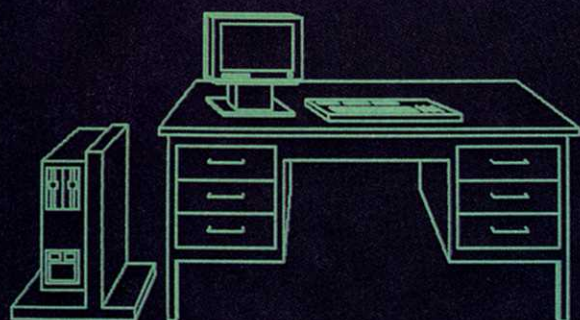


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The Floor Mount lets you store the CPU unit up to eight feet away from the Monitor and Keyboard.

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Photo 4. A screen display illustrating the Model 2000's high-resolution monochrome graphics. Shown is an excerpt from Tandy's demonstration program, indicating a possible Model 2000 system setup. The monitor (on its optional pedestal) and keyboard sit on the desk, while the CPU stands on its (optional) floor mount beside the desk.

mands that produce lines, arcs, and circles.

With color graphics, the Paint command tints screen designs, and you can bit-pattern (tile) the design to produce textured graphics. GW-Basic's Get and Put commands insert graphics into dimensioned arrays, which you can put back on the screen to simulate animation.

Other GW-Basic features include screen windowing, music and sound commands, light pen and joystick support, full-screen editing, full RS-232 capability, and a "soft key" utility that lets you define function keys as Basic key words.

(See sidebar for capsules of MultiMate, dBaseII, and MultiPlan.)

The Documentation

The Model 2000 comes with three manuals: an 80-page introduction to the Model 2000, a guide to GW-Basic, and a guide to MS-DOS.

The guides are departures from previous Tandy manuals, coming in 5- by 8 1/2-inch three-ring binders. The Basic manual is 368 pages long, and the MS-DOS manual 296 pages.

Hardware		Software	
Base unit (includes main unit and keyboard, 128K, two drives)	\$2750.00	MultiMate	\$249.95
Base unit with 10 Mbyte hard disk	4250.00	PFS:File	140.00
VM-1 monochrome monitor	249.00	PFS:Report	125.00
CM-1 color graphics monitor	799.00	dBase II	595.00
Hi-res monochrome graphics option	399.00	Multiplan	249.00
Hi-res color graphics option	199.00	Videotex Plus	49.95
TV/Joystick option (avail. 3/15/84)	249.95	MS-Pascal Compiler	299.95
Digi-Mouse/Clock board (avail. 3/15/84)	119.95	MS-GW Basic Compiler	299.95
Digi-Mouse	99.95	MS-Fortran	349.95
Internal 128K RAM kit	299.00	MS-Assembler	99.95
128K External memory board	499.00	*Cobol	595.00
128K RAM upgrade kit	299.00	The Home Accountant Plus	124.95
Monitor pedestal	89.95	Planetfall	49.95
Floor stand	145.00	The Witness	49.95
		MAI/Basic Four Accounting Series:	
		General Ledger	495.00
		Accounts Payable	495.00
		Accounts Receivable	495.00
		*Inventory Control	495.00
		*Order Entry	495.00
		*Purchase Orders	395.00
		*Payroll	495.00
		*Multi-Tool Word	375.00
		*PFS:Graph	140.00
		*PFS:Write	140.00

Table 2. Price list of Model 2000 hardware and software.

*Product still under development at press time.

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☐ #GN42G Green Phosphor w/Anti-Glare	\$89.95
☐ #OR34 Amber Phosphor	\$89.95
☐ #OR34G Amber Phosphor w/Anti-Glare	\$99.95
also available:	
☐ #R22G Red Phosphor w/Anti-Glare	\$139.95
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Photo 5. The Model 2000 keyboard. The non-number keys are tiered down the keyboard, but the numeric keypad keys lie flat.

Tandy will also offer a *Programmer's Reference Manual* for Assembly-language programmers, and will include hardware information in the *Model 2000 Technical Manual*.

(80 Micro will review the manuals in a later issue.)

Finding a Place in the Market

Tandy does not consider the 2000 to be an IBM copy. They are selling it, rather, as a high-performance MS-DOS machine.

"It is not in any way an IBM work-alike," says Don White, a product line manager at Tandy. "It is truly a next-generation product."

"In every aspect you could mention, from disk space to graphics, it is superior to anything out there."

Director of Merchandising Ed Juge echoes White's sentiments. "The world doesn't need more IBM copies," he says. "If you want an IBM-like machine and don't want to buy an IBM product, there are plenty of machines just like it."

Juge sums up Tandy's attitude towards IBM thus: "They're a good company. But they're not known for making leading-edge products. I think we got the jump on them this time."

But there is no question that Tandy is aiming the Model 2000 squarely at the IBM PC market. Their benchmark tests compare it to the IBM. Their advertisement includes a Model 2000-IBM PC comparison chart. And IBM naturally comes up in nearly any conversation on the 2000.

Ironically, Tandy will use the software base largely developed by IBM's influence. The strategy, says White, is to go with well-known software that's proven and immediately available.

"The intent is to have the most popular software products available for this machine," he says.

Most of that software, and the software Tandy will offer initially, is obviously aimed at the businessman. But Juge says that Tandy will not sell the 2000 specifically as a business machine. "We won't target it at a specific market," Juge says. "Whether you want a computer for your business or home, if you want MS-DOS with beautiful color graphics and lots of expansion capabilities, this machine is for you."

With the Model 2000, Tandy now covers nearly every corner of the microcomputer market. The Model 4 continues with TRSDOS, the Models 12 and 4 run CP/M, and the Model 16 runs Unix.

"The market is segmented, no question about it," says Juge. "It might stay that way, or it might follow MS-DOS. It doesn't much matter to us."

What remains to be seen is how the TRS-80 computers do against each other. Will the Model 2000 encroach on the Model 4 from one side, while the Model 4P takes away sales on the other? How will the 2000 affect the Model 12? Will it see any penetration outside of business or will the Model 4 and Color Computer maintain the home market?

Again, Juge isn't concerned. "I don't think (the 2000) will have a great effect on the rest of the line," he says. "We feel that each product will stand on its own."

A Final Word

Naturally, no final judgments about the 2000 can be made until people have a chance to see, and the press has a chance to review, the machine. But if the 2000 lives up to its potential, we can expect the company to reestablish itself in the microcomputer marketplace over the next year or so.

And this will be good news to all TRS-80 owners, no matter what system they own. ■

Model 2000 Review Roundup

These three reviews are condensed evaluations of products available for the Model 2000. Although the authors based their judgments on each product's performance with another system, these capsule reviews give you insight into the quality and abilities of MultiMate, dBase II, and Multiplan. Read them for a glimpse of the power available to you now.

MultiMate
Softword Systems Inc.
52 Oakland Ave. North
East Hartford, CT 06027
\$495

MultiMate is one of the better designed and organized word processing packages available. It's a scaled-down mainframe system, so until now many of its features have been available only on dedicated word processors.

For the money, MultiMate offers unparalleled features and is more friendly than the competition. It comes with my highest recommendation because of its quality and, just as important, because Softword Systems Inc. seems prepared to fully support it.

The Package

The package includes three disks, one labeled Boot, the actual word processing software; one labeled System, the help files and printer action tables; and the third labeled Utilities, which contains software to convert ASCII files to MultiMate files and vice versa, a recovery program that attempts to rebuild documents that have lost data because of system error, and an edit program for the printer action tables.

Using the Program

While you start MultiMate from a menu, it's misleading to say that MultiMate is a menu-driven program. Many functions are available through ingenious implementation of the function, numeric, and alphabetic keys in conjunction with the shift, ALT, and control keys. More than 50 functions allow almost unlimited flexibility in moving within text and formatting a document.

Twenty-seven other key combinations available on the regular keyboard and numeric keypad let you invoke functions such as print pitch control, subscripts, superscripts, and so on. An excellent on-line help facility describes which keys do what.

Another impressive feature of MultiMate is the speed with which it moves text around on the screen. Pages don't scroll onto the screen—they appear instantaneously.

MultiMate is a page-oriented word processing system, which means that it stores each page as a separate document on the disk. If the system should crash while you're working on a document, the most damage you'll do is lose the page on which you were working.

Also, page-oriented word processing obviates system memory problems that some packages have because the

entire document doesn't have to reside in memory at once.

Another feature of MultiMate is its ability to add and subtract columns of numbers in a text document. MultiMate can also copy, delete, insert, or move columns of numbers or text.

A key feature of MultiMate is the use of highlighting to demarcate the text you've manipulated. By using the cursor control keys or the various function keys (word, line, sentence, or paragraph highlight), you tell the computer what text to copy or move. That text then appears highlighted on the screen.

MultiMate has a sophisticated and comprehensive list of document formatting features. The program supports most printers found in the home and office. Softword Systems will customize MultiMate to match a printer you own if it doesn't currently support your particular model. They provide a toll-free support line to answer questions on printer support or handle problems you might have with the program.

MultiMate lets you insert printer control codes in your documents. The program supports underlining with the Epson dot-matrix printer, five-line headers and footers, alternate page headers and footers, and automatic page numbering. A merge

function creates form letters that automatically insert variables.

Unique to MultiMate is the ability to instruct files to print at a later date or time. Also, you can request that MultiMate print the document in the foreground or background; if you choose the background option, you can work on a new document while the first one prints out in the background mode. You can also specify the start and stop page numbers.

MultiMate offers a unique record-keeping system to track documents as you create them. When you enter the Create New Document mode, you are presented with a header document screen that lets you identify specifics about the text you're creating, such as the author, system operator, identification key words, and comments. The program automatically enters the creation date and update date.

If you later want to find the document, you can search for it using the fields from this same screen. For instance, you can specify a date or a range of dates by which to search and enter information such as author, operator, or subject. The program locates all documents that meet the search criteria.

MultiMate requires a lot of random-access memory because all the programs reside in memory while you're using the package. Additional memory provides little benefit since the program works on one page at a time.

The only practical way to use this program is with two disk drives. While in theory you could use one drive, there would be little room left on a single disk for a document because the system disk is already almost full (on single-sided drives).

The program isn't copy-protected so you can make back-up copies as required. MultiMate's documentation is conveniently tabbed and well-organized, and the instructions are clear and concise.

Drawbacks

Even MultiMate has a few faults. The cursor moves slowly when moving word by word, which seems odd for a program that otherwise runs so fast. When renumbering a document after making many changes, end-of-paragraph markers sometimes appear in the text at the end of lines.

Also, it is a bit of a nuisance to have to use a third disk for the utilities; given the size of MultiMate, I do not see any alternatives. ■

This condensed review of MultiMate is based on the review by Shawn W. Bryan that appeared in the November 1983 issue of Desktop Computing. Bryan evaluated the MS-DOS version for the IBM PC with 128K of RAM.

dBase II
Ashton-Tate
9929 Jefferson
Los Angeles, CA 90230
\$700

dBase II is a relational data base, which means it is a data base structured like a table. As with any data base, you can categorize and store data in table format and later recall that data according to category or combination of categories.

The program is written entirely in Assembly language and so operates very quickly. It's written in the style of a command-line interpreter so you don't have to wade through a series of menus to get to the desired operation. This feature also lets you write programs in the dBase II data-manipulation language so you can easily set up custom applications or automate a frequently used sequence of commands.

dBase II works with up to 65,535 records in one file. Each record contains up to 32 fields and up to 1,000 characters. However, by employing a Link option, you can treat two files as one for a total of 64 fields and 2,000 characters per record. This translates into a 130-Mbyte file that dBase II can manipulate.

Obviously, you aren't software limited with dBase II, but hardware limited with most microcomputers. Any given field of a record can have a maximum of 254 characters.

You can use two data files simultaneously, and by entering Use followed by a file name, you can substitute a new file for one of the current files. Several commands involve a third file in their operation, providing even more versatility and convenience.

dBase II provides over 50 major commands, most of which allow several options. You can use the majority of these commands interactively, and you can use all of them in the command files to form a structured programming language. However, the casual user can effectively use dBase II interactively with only 11 commands: Create, Use, Append, Locate, Display, Delete, Recall, Edit, Sort, Report, and Quit.

You enter data into dBase II from the keyboard or from other data files by using the Append command. These files can be either dBase II formatted files or in a delimiter-type format.

Similarly, you can write data out in dBase II format or a delimiter-type format with the Copy command. This ability, in combination with chaining capability, lets you conveniently interface dBase II command files to other programs.

A general Report command is available for generating quick table-type reports. There are also cursor positioning commands for special printing needs or custom displays.

You can use data files to update other files, either adding to or replacing data in certain fields if certain conditions (which you specify) are met.

Calculational commands total a given data base's numerical data to another data file or transfer the sums of a designated field to in-memory variables. In both cases, you can embed conditional instructions in the commands to limit their effect.

dBase II also contains a full-screen editor that you can use to edit records and build command files.

You can organize dBase II data bases in either of two ways. Sorting a data base rearranges the records on the file according to any field you specify, which takes time on a large file. You can use successive sorts if you require different levels of organization. If you use this method regularly on a given file, you can set up a simple command file to do successive sorts automatically.

You can also index any given data file on any combination of fields totaling fewer than 100 characters. Indexing a file is considerably faster than sorting it. You only need to index once, since subsequent appends,

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edits, replaces, or deletes automatically update the Index file. You can maintain up to seven indexes simultaneously on one file.

Once you index a file, you can use a Find command to locate a specific record. Typical search times on a floppy disk system take under two seconds. Also, a Locate command searches out data whether or not you've indexed a data file, although not as quickly.

If you have two data files with different structures but with at least one common field to serve as a key, you can use the Join command to form a new data file from a combination of the two.

dBase II is well documented with over 350 pages split between a tutorial and a reference manual. It's also well supported and is continually being improved. Several other programs are available to support dBase II, including program generators for quickly building command files, and programs that interface dBase II to other established software packages. All in all, dBase II is an exciting alternative and a program worthy of serious consideration. ■

This review is a condensed version of one by Clyde Lightfoot that appeared in Microcomputing, October 1982. Lightfoot evaluated dBase II for CP/M systems.

Multiplan
Microsoft Corp.
10700 Northup Way
Bellevue, WA 98004
\$275

Microsoft's Multiplan spreadsheet program performs superbly. It's a two-disk package that provides impressive versatility in what-if calculations.

Multiplan's disks are called Boot and System. I found out quickly that the System disk doesn't boot up unless you first load the Boot disk. Afterward, you're asked to insert the System disk and type RETURN. A spreadsheet then appears on your screen.

The spreadsheet consists of 25 rows by 63 columns, for a total of more than 16,000 locations or cells. Cells can contain values, formulas, or labels, and sometimes a combination of these.

Features

You can perform any kind of arithmetic calculation in single cells or by interaction of cells. You can also name individual cells, rows, and columns, and then continue to construct your spreadsheet. For instance, you could ask the program to arrive at costs by adding the columns "Material" and "Labor" and "Overhead," instead of using a much more complicated formula.

All standard statistical functions, such as minimum, maximum, look-up, sum, and others, are available. You will find built-in logical and transcendental functions, such as True, False, Not, Or, If...Then... Else, trigonometric functions, log, and so forth. Multiplan also supports dollar and percent formats not found in other spreadsheets. Additionally, you can sort either alphabetically or numerically.

If you're working with a large spreadsheet, you can divide it into "windows." It's possible to maintain eight active windows at one time, allowing you to keep track of many critical areas simultaneously.

Internal rate of return (of an investment) is one of the more complicated, and sometimes controversial, calculations Multiplan performs. It can solve most internal rate of return problems by iteration. It also calculates standard deviations and net present values.

Multiplan offers various features not available with VisiCalc. Multiplan's scrolling is faster and more versatile, and you can move the cursor in any direction. Cells can contain values plus letters, a dollar, or a percent format. Variable column widths are available.

You can name columns, rows, or whole blocks of data for future reference in calculations. You can lock individual cells or blocks of cells to avoid losing formulas or data accidentally. If you have made changes in your model since you loaded it,

the program recalculates when you ask to save a file.

You can tell the program where to print your model by specifying right and top margins. And you can save print parameters in your model file so you don't have to remember a print format every time you use the program.

The program displays the main menu at the bottom of the screen at all times. This makes it possible, most of the time, to give commands in plain English. A special help menu is available to explain commands further. The menu can be distracting once you learn the commands, and there's no way to get it off the screen, a disadvantage.

Documentation

The Multiplan package includes a handy Quick Reference Guide and a 421-page manual. It's certainly one of the better software manuals—detailed and well-written. But, because of the complexity of the subject matter, many intricate features aren't fully explained. You'll still need hours of experience before you fully master Multiplan.

One of the first things you learn from the documentation is how to make one back-up copy of the software. It's highly recommended that you do this right away. With careless handling, it is possible to lose this one-time ability on the original disk. The System disk is not copy-protected.

If you get stuck, Microsoft operates one of the better telephone support systems in the industry. I had occasion to call the hot line and received prompt, courteous, professional answers to my questions every time.

Multiplan has so many features that it is impossible to describe them all here. As a matter of fact, I have only scratched the surface. It's unlikely that you will come across a legitimate problem in the framework of spreadsheets that Multiplan will be unable to solve. ■

This condensed review of Multiplan 1.06 is taken from the review by G.R. Brieger that appeared in Desktop Computing, July 1983. Brieger evaluated the version for the Apple IIe with 128K of RAM.

... on, off, and on respectively. Supply a ...
... of the hours, minutes and seconds for h, m and ...
... respectively. When the time specified corresponds to the ...
... time, strike a key and TDD sets the current date and ...
... to continue.]



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MS-DOS Overview

by Jim Heid

MS-DOS is the disk operating system (DOS) used by Tandy's new Model 2000 and the IBM Personal Computer and its many clones. The technical differences between MS-DOS and other TRS-80 operating systems are too extensive to adequately cover in a single article; therefore, I'll consider only the major differences you'd encounter.

The two versions of MS-DOS in wide use are MS-DOS 1.X and MS-DOS 2.X. The MS-DOS 2.X series is generally compatible with its predecessors. The Model 2000, like the IBM PC, runs under MS-DOS 2.0.

Commands and File Names

The Table lists the MS-DOS commands and their functions. MS-DOS has two types of commands: external and internal. The code that executes internal commands always resides in memory, while you must load the code that handles external commands from a system disk.

MS-DOS file names can be one to eight characters long, with an optional three-character extension separated from the file name by a period (for example, PINBALL.BAS). MS-DOS lets you use certain special characters (\$, #, %, <, and so on) in file names; non-2000 TRS-80 operating systems allow letters and numbers only.

Another difference found with MS-DOS is that its drives aren't numbered; they're lettered A, B, C, and so on. And the drive letter must appear before the file name, not after it (for example, A:PAYROLL.DAT).

When you use a lot of MS-DOS commands, you can use wildcard characters in your file name. The command DIR *.COM, for example, displays a directory of all files with the .COM extension. Similarly, the command ERASE T?T.BAS erases files named TOT.BAS, TAT.BAS, and TXT.BAS.

One annoying difference between MS-DOS and all non-2000 TRS-80 DOSes is that MS-DOS deals only

with one disk drive at a time. When you boot up MS-DOS, drive A is active, or logged. If you need a file on drive B, you must specify B: in the file name. MS-DOS won't automatically search other drives when it doesn't find a file on the logged drive. (MS-DOS shares this limitation with CP/M.)

MS-DOS also lacks disk names and password protection. Anyone can see, update, and erase your files.

Command	Purpose	TRS-80 Equivalent
CHKDSK	Reads a directory, reports free space, number of files, free memory.	DIR (A)
COMP	Compares two files for differences.	none
Copy	Copies files (supports wildcards). Also appends files and copy to or from a device.	Copy
Date	Changes system date.	Date
DEL	Identical to Erase (below).	Kill
DIR	Displays directory of files (supports wildcards).	DIR
DISKCOMP	Compares two disks for differences.	none
DISKCOPY	Copies an entire disk.	Backup
Erase	Deletes a file from a disk.	Kill
EXE2BIN	Converts files produced by Link program to .COM (command) format.	none
Format	Initializes a disk.	Format
Mode	Sets mode of operation of a printer for a display connected to color graphics adapter or for serial communications port.	Forms
Pause	Pauses system during batch-file execution.	Pause
REM	Displays remarks from within batch files.	period (.)
REN	Identical to Rename.	Rename
Rename	Changes the name of a disk file (supports wildcards).	Rename
SYS	Transfers operating system files.	none
Time	Changes system time.	Time
Type	Displays contents of a file on the display.	List

Table. Summary of MS-DOS commands. The TRS-80 equivalents column lists similar commands found in some TRS-80 DOSes. Some equivalents do not function exactly like the MS-DOS command, but are similar enough for comparison purposes.

Utility Programs

MS-DOS comes with a debugging utility (Debug), a linking program (Link), and an archaic, line-oriented editor (EDLIN).

The Debug program has the usual commands to display and modify memory and register contents, and it lets you execute a machine-language program with up to 10 breakpoints. When Debug encounters a breakpoint, it stops execution and displays the registers, flags, and the next instruction you want executed. The program doesn't support single-stepping.

Debug also edits the contents of a disk file, compares two blocks of memory, fills a block of memory with a given value or values, searches memory for a specific string or value, performs disassemblies, performs hexadecimal arithmetic, and inputs or outputs a byte to or from a given port. Debug is a fairly powerful utility, but no more so than the LDOS or TRSDOS 6.0 debugging programs.

The Link program produces relocatable modules and combines separately produced object modules. It is most valuable to Assembly-language programmers. Its closest relative in the TRS-80 world is LDOS's CMD-FILE and, more distantly, NEW-DOS80's LMOFFSET.

EDLIN is a text editing program most often used to create batch files (do-files or JCL files to the TRS-80 user) and small Assembly-language source code files. EDLIN has limited search and replace capabilities, and not a whole lot more.

Since it's a line-oriented editor, you press the enter key at the end of each line, and you edit lines one at a time. Conversely, a full-screen editor lets you move a cursor around the screen and reformats a block of text if you make deletions or insertions.

MS-DOS

Introduced in the spring of 1983, MS-DOS 2.0 was originally written for the IBM PC-XT, a PC with built-in hard disk drive. MS-DOS 2.0 uses the same commands as its predecessors, and adds a special directory structure that makes it easier to manage the megabytes.

The directory structure is most similar to that of the Unix operating system. It lets you group any related files in their own directories, making file management much easier.

You could, for example, put all your word processing files in one directory, all your payroll files in another, and all your data-base management files in a third. Instead of seeing hundreds of file names scroll by when you display a directory, you see only the file names of the category in which you're interested.

In the pre-Model 2000 TRS-80 world, only TRS-Xenix (available for the Model 16) offered this kind of convenience. (For more information about this type of directory structure, see the "Using Unix-Xenix" series in *80 Micro* (Part I, November 1983, p. 212).)

MS-DOS 2.0 also lets you redirect program input and output. You could tell a sorting program, for instance, to use the output of the directory command as its input. You

could instruct a data-base manager to send its output (which would normally go to the screen) to a mailing list program to be used for input (which would normally come from the keyboard). This technique is called piping, because you can redirect data as if it were going through pipes.

In general, MS-DOS 2.0 seems to be a stepping stone toward what might some day be a multi-user, multi-tasking operating system.

Conclusion

MS-DOS is not the ultimate DOS. Like the computer that first made it famous, it's actually quite conventional. Also like the IBM PC, it's incredibly popular. More software is written for MS-DOS than for any other 16-bit operating system, and that's something to think about for the consumer who's buying a new machine, and for the programmer who's writing a new program. MS-DOS is where it's at.

Moreover, MS-DOS is going somewhere. Version 2.0, with its Unix-like directory structure and flexible device handling, is only a glimpse at the power and flexibility that tomorrow's—or, in the case of the 2000—today's microcomputers offer.

Look for a menu-driven command processor that makes using the system easier for noncomputerists. Look for file and record locking, as well as password protection. MS-DOS will change and evolve as the hardware it runs on changes and evolves, and each new generation will make computers more powerful and easier to use. ■

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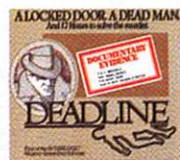
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Touch or Sound Typewriter

by A.J. Barnard Jr. and David Barnard

This touch- or sound-actuated typing program allows physically handicapped persons to communicate using a Model I/III and a printer.

Producing typewritten text is a simple and useful means of communication and documentation. But for many physically handicapped persons, using a typewriter is virtually impossible.

This article presents a revised Model I/III Basic program called TOSTYPER that turns your computer into a sound- or touch-actuated typewriter (see "Voice-Controlled Typewriter," 80 Micro, December 1982, p. 72). It allows persons with little or no muscular control, but with normal intelligence, to manipulate the screen cursor to type characters through a printer.

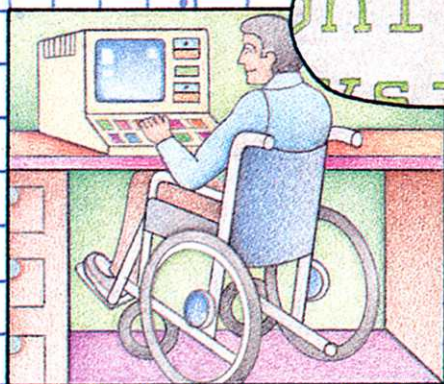
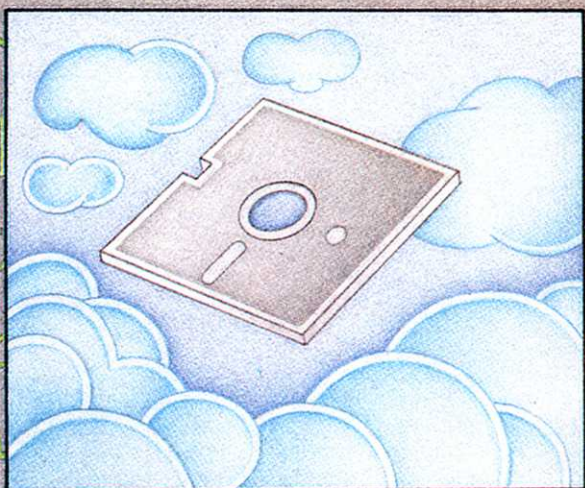
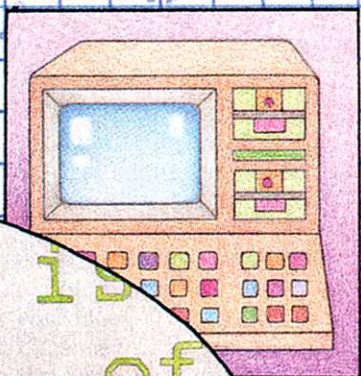
The program's two options let you

use a computer to communicate by uttering a sound or touching any key or the space bar. Once someone boots up the program, the handicapped user can operate independently and gain the satisfaction of composing and communicating through written text.

Sound vs. Touch Control

In the original program, you select the character or command you want by making a sound as the cursor moves through a screen display of the alphabet, some punctuation, and commands. The program picks up the sound through the microphone of a cassette

The system is
the number of
emer...ed;
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Collins

recorder operating in the play/record mode. The signal goes to the computer through the earphone jack. An INP (255) command polls the cassette port before the cursor moves from one character to another.

We reduced this sound-actuated control to the subroutine in line 60 of the Program Listing. When it receives a response, the program sets the F flag.

Some handicapped persons, regardless of their ability to utter a sound, have sufficient muscular activity and control to tap with a pencil, press a button, and so on. Our revision allows optional selection of characters by a key press through the routine in line 50;

PEEK(15359)>0 corresponds to an INKEY\$ command.

TOSTYPER (touch or sound typer) is more compact than the original program, placing the character set in an array, using numeric offsets for screen positions, and introducing subroutines and For...Next loops. The program prompts you (or an aide) to select sound or touch control.

Character Sets

To make characters or commands as easy as possible to enter, we arranged the screen display of the character set so that the most frequently used text characters are closest to the home position

of the cursor. Since you use the blank space most frequently, it appears in the home position.

We include two character sets with TOSTYPER. The first, a simple character set, consists of the alphabet (in uppercase), the 10 digits, and some punctuation marks. The second, a full character set, incorporates the simple set and all of the Model I's other printable characters. The full set is shown in Fig. 1.

Both the simple and full character sets are in array E\$ (lines 700-720). Each set is arranged in an eight-column format.

When you first run the program, it installs the simple character set. Select C-SET with the cursor to change back and forth between the simple and full sets. Offset CH has a value of 8 for the simple set and zero for the full set. The program controls screen arrangement (lines 100, 110, and 200) from CH and the H and L arrays, which include the sequence number of the first and last character in each column (line 730).

The Enhanced Mode

To enhance the character set further, you can add some frequently used, two-letter combinations (digrams) to the program. A more effective enhancement involves placing frequently used digrams, trigrams, and common words in an array that you call from the main character set display.

On the main display, each letter that has an enhanced mode appears with a plus sign appended. To get into the enhanced mode (flag EN set) or back to the regular mode, use the cursor to select the XTRA? option. Fig. 1 shows the enhanced mode we developed for the letter E. If you select E+, 15 options beginning with E appear at the bottom of the screen and you select one of these words as the cursor moves through the display. Select Return and only the E registers.

SPACE	N+	T+	R+	L+	.	,	ERASE
E+	I+	S+	M+	H+	9	8	7
A+	O+	P+	G+	0	6	5	4
C+	U+	B+	K	1	2	3	:
D+	Y+	V+	?	!	'	"	:
F+	Q	X	J	(	)	<	>
W+	Z	/	-	*	+	=	
PRINT	#	%	↑	&	\$		
ADJUST	C-SET	XTRA?	@				
ERE	RETURN	EA	ED	EN	ER	ES	ENT
EVERY/	ERS	EVE	EAT/	END/	EACH/	EASY/	EARLY/
EVERY GOOD BOY = = = = = 987654321							

Figure 1. Regular character set in enhanced mode with secondary display for letter E.

Line Number(s)	Module Description
30	Go: title/initialize/instruct/start
50	Touch control subroutine
60	Sound control subroutine
70	Delay subroutine
100-120	Set display and mark print line
150-160	Move cursor and select column
200-210	Move cursor down column and select character or control
250-320	Process selected character or control
350-390	Display and allow selection of multi-letter combinations
400-460	Allow adjustment of cursor speed and print line length and spacing
500-510	Define variables
550-640	Read multi-letter combinations to array
700-720	Read character sets to array
730	Put sequence numbers of first and last characters in columns in arrays
740	Put legend for adjusts in array
750-760	Title; verify printer ready
800-820	Select touch or sound control
850-880	Give instructions for sound control
900-950	Show general instructions

Table 1. TOSTYPER Modules.

The Key Box

Models I and III
16K RAM Cassette Basic
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EXPECT A MIRACLE

Program Listing. TOSTYPER.

```

0 'STATUS 5/20/83
2 ' --- T O S T Y P E R ---
   TOUCH- OR SOUND-CONTROLLED PRINTING
   FOR TRS-80 MOD I & III
   A. J. BARNARD, JR. & DAVID BARNARD
3 '
4 '   BASED ON M. RIGSBY, 80 MICRO 12/82, 72-7
5 '   OPTIMIZED BY SUBR.'S/LOOPS & CHAR.-FREQ. BASED
   DISPLAY, ALLOWING CHANGE IN PRINT LINE LENGTH
   & SPACING, & USE OF ENHANCED CHAR. MODE.
6 '
30 CLEAR1400:GOSUB750:GOSUB500:GOSUB800:GOSUB400:GOTO100
50 F=0:CS=120-Q*10:IFFSTHEN60ELSEFORX=1TOCS
   :IFPEEK(15359) THENF=1:X=CS:NEXT:RETURNELSENEXT:RETURN
60 FORX=1TOCS:OUT255,00:IFINP(255)>200:F=1:X=CS:NEXT:RETURN
   ELSENEXT:RETURN
70 FORX=1TO75+50/Q:NEXT:RETURN
80 GOSUB70:GOTO50
100 CLS:FORI=0TO7:PRINT(3+I*8),CHR$(160):NEXT
   :FORK=1+CHTO8+CH:FORI=H(K)TOL(K):ET$=""
   :IFEN=0ANDLEN(ES(I))=2THENET$=LEFTS(ES(I),1)ELSEET$=ES(I)
110 PRINT(131+(K-CH-1)*8+(I-H(K))*64,ET$;NEXTI,K
120 FORI=0TOP-10:PRINT(PL+I,SS;NEXT:PRINT"987654321";
   :IFB>0THENPRINT(PL,AS;
150 K=0
160 GOSUB70:GOSUB70:POKECC+8*K,U:K=K+1:GOSUB80:IFFTHEN200
   ELSEPOKECC+8*(K-1),V:IFK<8THEN160ELSE150
200 GOSUB70:C=R-9+K*8:POKEC-128,V:POKEC,U:GOSUB70
   :K=K+CH:FORI=H(K)TOL(K):GOSUB80:IFFTHENB$=ES(I):I=L(K)
   ELSEIFI<L(K) THENZ=C+64:POKEZ,U:POKEC,V:GOSUB70:C=Z
210 NEXTI:POKEC,V:IFF<1THEN150
250 N=LEN(B$):IFN>2THEN260ELSEIFN<2THEN270
   ELSEB$=LEFT$(B$,1):IFNTHEN350ELSE270
260 IFB$="ADJUST" THENGOSUB400:GOTO100ELSEIFB$="ERASE" THEN300
   ELSEIFB$="PRINT" THEN290ELSEIFB$="XTRA?" THEN310
   ELSEIFB$="C-SET" THEN320ELSEIFB$="SPACE" THENB$=""
270 AS=AS+B$:B=LEN(AS):IFB<PTHENPRINT(PL,AS;ELSE290
280 IFLEN(B$)>1THEN150ELSEGOSUB50:IFFTHENB=B+1:GOTO270ELSE150
290 LPRINTAS:AS="" :B=0:GOTO120
300 IFBTHENB=B-1:AS=LEFT$(AS,B):PRINT(PL+B,SS:GOSUB50
   :IFFTHEN300ELSE150ELSE150
310 IFNTHENEN=0:GOTO100ELSEEN=1:GOTO100
320 IFCHTHENEN=0:GOTO100ELSECH=8:GOTO100
350 A=ASC(B$)-65:PRINT(PL,"RETURN";N=0
   :FORJ=0TONW:IFT$(A,J)=" THENJ=NW:NEXTJ
   ELSEPRINT(PL+(J+1)*8,T$(A,J);N=N+1:NEXTJ
360 FORJ=0TON:GOSUB70:POKEP+J*8,U
   :IFJ>0THENPOKEP+(J-1)*8,VELSEPOKEP+N*8,V
370 GOSUB80:IFF<1THENNEXTJ:GOTO360
380 IFJ>0THENB$=T$(A,J-1)
   :IFRIGHT$(B$,1)="/" THENB$=LEFT$(B$,LEN(B$)-1)+" "
390 J=N:NEXTJ:FORI=0TO2:PRINT(PL-9+I*64,ST$;NEXT:GOTO270
400 CLS:W=15360:ZX=0:I=0:G=Q:GOSUB460:CI=1:CL=1:CM=10
   :GOSUB410:Q=G:G=P:GOSUB460:CI=5:CL=15:CM=80:GOSUB410:P=G
   :G=LL:GOSUB460:CI=1:CL=0:CM=66:GOSUB410:LL=G:RETURN
410 FORE=1TO3:POKEW+(E-1)*20,U
   :IFE=1THENPOKEW+40,VELSEPOKEW+(E-2)*20,V
420 GOSUB80:IFFTHENZ=E:E=3:NEXTE:ONZGOTO430,440:RETURN
   ELSENEXTE:GOTO410
430 G=G-CI:IFG>CLTHEN450ELSEG=CL:GOTO450
440 G=G+CI:IFG>CMTHENG=CM
450 POKEW+(Z-1)*20,V:PRINT(PY,G:GOTO410
460 POKEW+40,V:Z=1+(I+ZX)*2:A=19+I*256:PY=15+A:C=114+A
   :PRINT(PL,AS(I+9+ZX);PRINT(PY,G:PRINT(C,D$(Z);
   :PRINT(C+20,D$(Z+1);PRINT(C+40,R$;W=R+I*256:I=I+1:RETURN
500 PRINT(666,29:POKE16553,255:DEFINTA-Z:NW=15:DIM ES(117),
   H(17),L(16),D$(12),T$(24,NW):U=191:V=128:Q=6:CH=8:B=0:P=30
   :EN=0:PL=896:S$=CHR$(140):CC=15362:PR=713:SP=16072:LL=1
   :R=15491:PC=666
510 PRINT(PL,28:ST$=STRING$(64,128):W1$="PRESS ANY KEY"
   :W$="-> MAKE A SOUND TO GO ON <-":R$="CONTINUE"
550 FORI=0TO24:FORJ=0TONW:READTT$:IFTT$=""
   THENJ=NW:NEXTJ,I,ELSET$(I,J)=TT$:PRINT(PL,27-I;NEXTJ,I
560 DATA AL,AN,AR,AS,AND,ARE,ATE,ATI,ALL/,ANY/,ABLE/,ABOUT/,
   ABOVE/,AFTER/,ALONG/,*,BE/,BY/,BIG/,BUT/,BACK/,BEAT/,BEEN/,
   BEST/,BOTH/,BEGIN/,BEING/,BRING/,BEFORE/,*
570 DATA CE,CO,COM,CON,CAN/,CUT/,CALL/,CAUSE/,COUNT/,COULD/,
   CROWD/,CHANGE/,*,DE,DO/,DAY/,DRY/,DEAR/,DEEP/,DOES/,DONE/,
   DOWN/,DAILY/,DOING/,DRIVE/,*

```

Listing continued

On initialization, the program places the combinations and words in array T\$ (lines 550-640), and dimensions it (line 500) for the letters A-Y and up to 16 combinations per letter (NW=15).

Note the trick in line 550 to avoid including a lot of null elements in the data statements. As the program reads data, it checks for an asterisk. If it finds one, it leaves that element and the remaining elements for that letter empty.

The data we installed in the enhanced mode includes about 40 common digrams that you can't enter more efficiently as single letters, the 21 most frequently used trigrams, the 100 most common words of general English text, and a few additional words useful in personal writing.

As seen in Fig. 1, Return is the first item in a secondary display. If you select it the single letter enters. The secondary display is further arranged by the number of characters and alphabetically. We added wordspace to words that are not also often-used digrams or trigrams—a slash indicates a word space.

In either mode, by holding down a key, or longer sound utterance, you can create a repeating action, thus typing double letters and spaces faster.

Program Operation

When you run the program (printer must be ready), the title page appears as the program counts down from 29 while it loads the arrays. At the end of the countdown, the program displays directions on how you select sound or touch control.

At this point the screen presents three options: Touch, Sound, and Continue. The cursor momentarily stops at each option. Press the spacebar (or any key) to select the option when the cursor is adjacent to it. Then do the same with Continue. From this point on, a handicapped user can operate the program independently.

The program presents you with more directions and allows you to make adjustments. You can adjust cursor speed from slow (1) to fast (10), select a line length of from 15 to 80 characters, and set line spacing. Do this by stopping the moving cursor at the appropriate position.

When you continue, the program starts in the simple character set, dis-

playing characters and commands. The cursor flashes across the top of the eight columns. Respond (in the touch mode) by pressing a key to make the cursor travel down a column with the letter or command you want to execute.

The commands are Adjust, C-Set, XTRA?, Print, and Erase. Adjust brings you back to the adjustment options, and C-Set sends you back and forth between the simple and full character sets. XTRA? displays the enhanced character set with words, digrams, and trigrams for each letter with a plus sign. These commands don't wipe out partial print lines.

The Print command prints out the line of text that you put together. The Erase mode wipes out any errors starting at the back of the line, one character at a time (unless you respond continuously by holding down a key or by making a continuous sound).

Additional Remarks

Refer to Table 1 for the program modules. It is a handy reference if you want to alter or specialize the program.

You can add sound control with an external microphone connected to a tape recorder, thereby placing the recorder farther from the user and reducing concern over room noise. The inexpensive Radio Shack replacement microphone 33-103A is appropriate. It lets you turn the recorder on and off with the slide switch on the mike throat if you plug the two line jacks into the auxiliary and microphone ports.

When you have 32K RAM or more in your system, you can increase the CLEAR 1400 in line 30 (i.e., CLEAR-MEM/3). If you want more words available in the enhanced mode, add them in the data statements of line 560-640. A word should be fewer than seven letters long. For a seven-letter word, there is no wordspace (no slash). You can increase the number of combinations and words allowed for a single letter, from 16 to 22, by changing the value of NW in line 500 because the dimensioning of T\$, reading data to it, and operation of the secondary display all tie to NW. ■

Listing continued

```

580 DATA EA,ED,EN,ER,ES,ENT,ERE,ERS,EVE,EAT,/END/,EACH/,EASY/,
    EARLY/,EVERY/,*,FAR,FOR,FEW/,FALL/,FELL/,FIND/,FROM/,FIRST/,
    FOUND/,*
590 DATA GO/,GET/,GAVE/,GIVE/,GOES/,GONE/,GOOD/,GROW/,GOING/,
    GREAT/,GUESS/,GIVING/,*,HA,HE,HAD,HAS,HAT,HER,HIS,HIM/,HEAR/,
    *,I/,IC,IN,IO,IS,IT,IF/,ILL,ING,ION,ITH,ITS/,INTO/,INSIDE/,*
600 DATA *,*,LE,LAY/,LIE/,LET/,LAST/,LATE/,LIKE/,LIVE/,LOOK/,
    LIGHT/,LITTLE/,*,ME,MY/,MAN/,MAY/,MADE/,MANY/,MORE/,MOST/,
    MUCH/,MUST/,MIGHT/,*
610 DATA ND,NG,NT,NO/,NEW/,NEAR/,NEED/,NONE/,NOTE/,*,OF,ON,OR,
    OU,OFF/,OLD/,ONE/,OUR/,OUT/,OWN/,OURS/,OVER/,*,PR,PAY/,PUT/,
    PAIR/,PART/,PASS/,PICK/,PLAN/,PIECE/,PLAIN/,PRINT/,*,*
620 DATA RA,RE,RI,RES,RAN/,RUN/,READ/,REAL/,REST/,RIDE/,RISE/,
    RESULT/,*,SE,ST,SO/,SEE/,SET/,SHE/,SHOW/,SLOW/,SOME/,SUCH/,
    SHALL/,SINCE/,SHOULD/,*
630 DATA TE,TH,TI,TO,TER,THA,THE,TIO,THAT/,THEM/,THEN/,THIS/,
    THEY/,THEIR/,THERE/,THESE/,UP/,US/,USE/,UPON/,UNDER/,UNTIL/,
    UP TO/,USEFUL/,*,VE,VER,VERY/,VIEW/,VISIT/,VALUE/,*
640 DATA WE/,WAS/,WHO/,WHY/,WANT/,WENT/,WILL/,WITH/,WHOM/,
    WORK/,WHERE/,WOULD/,WRITE/,*,*,YES/,YET/,YOU/,YEAR/,YOUR/,
    YOUNG/,YOURS/,*
700 PRINT@PC,2:FORI=0TO16:READS(I):IFES(I)="XX"THEN
    ES(I)=CHRS(34)ELSEFES(I)="YY"THENSES(I)=CHRS(91)
710 NEXTI:PRINT@PC,1:DATA SPACE,E+,A+,C+,D+,F+,W+,PRINT,ADJUST,
    N+,I+,O+,U+,Y+,Q,Z,*,C-SET,T+,S+,P+,B+,V+,X,/,*,*,XTRA?,"
    R+,M+,G+,K,?,J,-,YY,@,L+,H+,0,1,!,(*,&,
    ",",9,6,2,"",),+,$,"",8,5,3,XX,<=,ERASE,7,4,"",":",>
720 DATA SPACE,E+,A+,C+,D+,F+,W+,PRINT,ADJUST,
    N+,I+,O+,U+,Y+,Q,Z,*,C-SET,T+,S+,P+,B+,V+,X,/,*,*,XTRA?,"
    R+,M+,G+,K,?,J,-,L+,H+,0,1,!,",9,6,2,"",",",8,5,3,XX,
    ERASE,7,4,"",":",*
730 H(1)=0:FORI=1TO16:READL(I):H(I+1)=L(I)+1:NEXTI
    :DATA 8,17,26,35,43,51,58,64,73,81,89,96,101,106,111,116
740 FORI=1TO12:READDS(I):NEXTI:RETURN:DATA SLOWER,FASTER,
    SHORTER,LONGER,LESS,MORE,TOUCH (0),SOUND (1),"SPEED SETTING:",
    "LINE LENGTH:", "LINE SPACING:", "TOUCH VS SOUND:"
750 CLS:PRINTCHR$(23):PRINT@8,"--- T O S T Y P E R ---";
    :PRINT@128,"TOUCH- OR SOUND-ACTUATED PRINTER";
    :PRINT@196,"WITH ENTRY OF KEY WORDS AND";
    :PRINT@260,"MULTI-LETTER UNITS ALLOWED.";
760 IF(PEEK(14312)AND240)<>48THENPRINT@530,
    "READY PRINTER!";GOSUB70:PRINT@530,STRING$(18,32);GOTO760
770 PRINT@588,"==> INITIALIZING <==";:RETURN
800 CLS:PRINT
    "NOW SELECT TOUCH OR SOUND CONTROL (0 OR 1 SETTING). "
810 PRINT:PRINTTAB(8)W1$;" WHEN THE CURSOR (WHITE BLOCK) IS "
    :PRINTTAB(5)"NEXT TO 'TOUCH' OR 'SOUND'." :PRINT
    :PRINTTAB(9)"TO GO ON, ";W1$;" WHEN THE CURSOR IS "
    :PRINTTAB(6)"NEXT TO 'CONTINUE'."
820 I=2:ZX=1:G=0:GOSUB460:CI=1:CL=0:CM=1:GOSUB410:FS=G
850 IFFS<1THEN900ELSECLS:PRINT"TO ACHIEVE SOUND CONTROL:
    1. REMOVE THE 'AUX' AND 'MIC' PLUGS FROM THE RECORDER.
    2. PLUG AN EXTERNAL MICROPHONE INTO THE 'MIC' PORT OR
    FOR THE BUILT-IN ONE HAVE THE ROOM QUIET AND PUT"
860 S=15955:T=S+64:Y=T+64:Z=Y+65:PRINT
    "THE RECORDER ON A HARD SURFACE."
    3. AS PICTURED, DEPRESS 'RECORD' & 'PLAY' AND THE
    SMALL PIN AT THE COMPARTMENT REAR."
870 POKES,151:POKES+1,143:FORI=2TO13:POKES+I,131:NEXT
    :POKES+14,171:POKET,149:POKET+14,170:POKEY,181:POKEY+14,186
    :FORI=1TO13:POKEY+I,176:NEXT:POKEZ,U:POKEZ+2,U
880 PRINT@908,W$;:GOSUB50:IFFTHENCLS:PRINT:GOTO910
    ELSEPOKES+1,131:POKES+2,131:POKEZ,V:GOSUB70:POKEZ+2,V:GOTO870
900 CLS:PRINT
    "TO SELECT A CHARACTER (OR A CONTROL), PRESS THE SPACEBAR OR
    ANY KEY ON THE KEYBOARD, EXCEPT 'BREAK'." :PRINT
910 PRINT
    "THERE ARE 2 CHARACTER SETS: SIMPLE & FULL. TO CHANGE SETS,
    SELECT 'C-SET'. EACH SET HAS 2 MODES: REGULAR & ENHANCED. TO
    CHANGE MODES, SELECT 'XTRA?'."
920 PRINT:PRINT
    "IN THE ENHANCED MODE, IF THE SELECTED LETTER HAS '+' ADDED,
    YOU SELECT A MULTI-LETTER COMBINATION OR WORD, OR BY 'RETURN'
    ENTER THAT LETTER."
930 PRINT:PRINT
    "INITIALLY, YOU ADJUST THE SPEED FROM 1 (SLOW) TO 10 (FAST),
    LINE LENGTH FROM 15 TO 80 CHARACTERS, AND THE SPACING OF PRINT
    LINES FROM NONE UP. TO ALTER THESE SETTINGS, SELECT 'ADJUST'."
940 IFFSTHENPRINT@972,W$;:GOSUB50:IFFTHENRETURNELSE940
950 PRINT@992,"> ";W1$;" <=";:GOSUB50:IFFTHENRETURNELSE950

```

For correspondence concerning TOSTYPER, contact A.J. Barnard Jr., J.T. Baker Chemical Co., Phillipsburg, NJ 08875.

Dot Talk

by Mike Rigsby

Braille is a writing system for the blind that uses raised dots in place of letters and characters. Dedicated, commercially available braille character generators are expensive, so I wrote a Model I/III Basic program called Braille that translates conventional text into braille and prints it on a letter-quality or dot-matrix printer (see the Program Listing).

Braille prints braille text on paper using the impact of the print head to produce the dots. To read the generated text, you have to turn the paper over.

The Program

This program produces Grade I braille only, a simple letter-by-letter translation of text to braille (Grade II braille uses a compacted dot pattern and increases the rate at which you can read material).

This program translates conventional text into braille characters using a standard printer.

Braille supports only lowercase letters, spaces, and periods (see the Figure). The program lets you store and print braille code to and from tape. You can thus produce multiple copies of the same text.

Printers

The ideal printer for this braille system is a converted IBM selectric or daisy-wheel printer. Set the impact force to maximum and use a low-

quality bond paper. You get the best results when you insert four sheets of paper into the printer together.

If you have a dot-matrix printer, don't despair. Use a 9-inch strip of 1/2-inch wide double-stick cellophane tape and latex rubber from household dishwashing gloves. Tape the latex side of the glove rubber and expose the flock-lined side. Tape this to the platen behind the computer paper. This system uses a letter O to produce the impact on the paper.

Program Operation

Braille uses the INKEY\$ function to determine when you've pressed a key. It converts the character you enter to ASCII code and produces the proper dot combination. I programmed Braille to produce only lowercase letters, so the ASCII code for an uppercase letter gets converted.

After you type in 15 characters, the program scans the entered text for a space, at which point it begins printing or recording. More than 20 characters makes the printer overshoot the edge of conventional 8- by 10-inch paper.

The dot pattern produced by this program is readable, but it's slightly larger than the standard size for braille documents. A printer capable of advancing in increments of half-spaces produces nearly perfect braille text. ■

Write to Mike Rigsby at 5164 Sunburst Drive, Norcross, GA 30092.

.	:	..	::	.	:	::	:	.
a	b	c	d	e	f	g	h	i
::	.	:	..	::	.	::	::	::
j	k	l	m	n	o	p	q	r
.	:	.	:	.	:	:	.	:
s	t	u	v	w	x	y	z	.

Figure. Braille alphabet.

Program Listing. Braille printer.

```

5 CLEAR 500
6 S=80
7 Z5$=" "
10 CLS
13 INPUT"IF YOU WISH TO PRINT BRAILLE FROM A TAPE, TYPE 'Y';N$
14 IF N$="Y" THEN 1100

```

Listing continued

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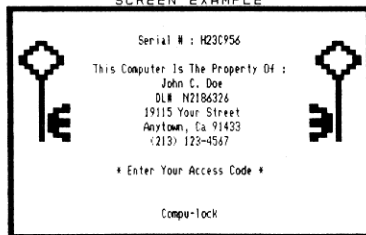
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Listing continued

```

15 INPUT"IF YOU WISH TO OUTPUT TO TAPE RATHER THAN PRINTER, TYPE '
Y'";M$
20 A=0:B=0:C=0:D$="":E$="":F$="":G$=""
30 A$="":B$="":C$=""
40 A$=INKEY$
50 IF A$=""THEN40
55 GOTO 400
70 B=ASC(A$)
80 B=B-64
90 ON B GOTO 100,100,200,200,100,200,200,100,300,300,100,100,200,2
00,100,200,200,100,300,300,100,100,300,200,200,100
100 C$=""
110 GOTO 500
200 C$=""
210 GOTO 500
300 C$=""
310 GOTO 500
400 IF A$="" THEN 420
405 IF A$="" THEN 450
410 GOTO 70
420 C$=""
430 GOTO 500
450 C$=""
460 GOTO 500
500 B$=C$+B$
550 IF A$="" GOTO 900
555 IF A$="" GOTO 900
600 ON B GOTO 650,700,650,800,800,700,750,750,700,750,650,700,650,
800,800,700,750,750,650,700,750,650,800,800
650 D$=""
660 GOTO 900
700 D$=""
710 GOTO 900
750 D$=""
760 GOTO 900
800 D$=""
810 GOTO 900
900 E$=D$+E$
920 IF A$="" GOTO 1000
930 IF A$="" GOTO 1000
950 ON B GOTO 960,960,960,960,960,960,960,960,960,960,970,970,970,
970,970,970,970,970,970,980,980,990,980,980,980
960 F$=""
970 F$=""
980 F$=""
990 F$=""
1000 G$=F$+G$
1010 A=A+1:IFA>15 THEN 1040
1015 PRINTA$
1020 GOTO 40
1040 IF A$="" THEN 1060
1045 PRINTA$
1050 GOTO 40
1055 IF M$="Y"THEN 1095
1060 IF M$="Y" THEN 1095
1061 R=LEN(B$):R1=LEN(E$):R2=LEN(G$)
1062 IF R<S THEN GOSUB 1200
1063 IF R1<S THEN GOSUB 1300
1064 IF R2<S THEN GOSUB 1400
1065 LPRINTB$
1070 LPRINT E$
1080 LPRINT G$
1090 LPRINT
1092 GOTO 20
1095 PRINT#-1,B$,E$,G$
1097 GOTO 20
1100 INPUT#-1,B$,E$,G$
1102 R=LEN(B$):R1=LEN(E$):R2=LEN(G$)
1107 IF R<S THEN GOSUB 1200
1108 IF R1<S THEN GOSUB 1300
1109 IF R2<S THEN GOSUB 1400
1110 LPRINTB$
1120 LPRINTF$
1130 LPRINTG$
1140 LPRINT
1150 GOTO 1100
1200 B$=Z$+B$
1210 R=LEN(B$)
1220 IF R<S THEN GOTO 1200
1230 RETURN
1300 E$=Z$+E$
1310 R1=LEN(E$)
1320 IF R1<S THEN GOTO 1300
1330 RETURN
1400 G$=Z$+G$
1410 R2=LEN(G$)
1420 IF R2<S THEN GOTO 1400
1430 RETURN

```


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The Taxman Cometh

by Robert Athanasiou

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Even if you don't get audited, Taxman will make your life easier at tax time.

How It Works

Figure 1 shows the screen when you enter data. The program is self-prompting. It records up to 200 entries and lets you scroll them for review. Each data entry column is prompted by a set of underline characters [CHR\$(95)] and directions at the bottom of the screen.

You can backspace to correct wrong entries at any time, as well as delete or insert lines. You enter the amount of your deduction as you would on a calculator, with the decimal point and dollar sign already in place.

When you're in the command mode (see Fig. 2), the arrow keys control screen scroll. You can scroll continuously by holding the up-arrow key; if you press both the shift and up-arrow keys simultaneously, you'll scroll until you press another key. The down-arrow key works the same.

The Key Box

**Models I and III
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Printer**

ENTER ITEMS USING THESE CATEGORIES: W = Wages, S = State w/held
F = Fed w/held, E = FICA(Soc.Sec), B = Bus/Prof, I = Interest,
D = Dvdnd, C = Contrib, T = Taxes, M = Medical, O = Other

CODE/CAT	DATE & SOURCE OF INC OR DED	AMOUNT
DC	ARRL DEVELOPMENT FUND	\$ 100.00
ID	EMPLOYEES CREDIT UNION #12345	\$ 56.21
II	2ND NATIONAL BANK ACCT # 456789	\$ 98.78
DF	FEDERAL TAX	\$12345.67
DS	STATE TAX	\$ 1234.56
DE	FICA	\$ 2019.95
IW	-----	\$ -----

ENTER THE SOURCE OF INCOME OR DEDUCTION
** press <up-arrow> to go BACK one column

Figure 1. Data-entry screen.

ENTER ITEMS USING THESE CATEGORIES: W = Wages, S = State w/held
F = Fed w/held, E = FICA(Soc.Sec), B = Bus/Prof, I = Interest,
D = Dvdnd, C = Contrib, T = Taxes, M = Medical, O = Other

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DI	MORTGAGE: 1ST NAT'L BANK	\$ 1230.00
DI	CREDIT CARD REVOLVING CREDIT ACCT	\$ 1.23
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<P>PRINT FILE <L>LOAD FROM DISK <R>RESUME <Q>QUIT
<D>DELETE <I>INSERT <S>SAVE ON DISK <Y>YTD SUMMARY

Figure 2. Command-mode screen.

I inserts a line, and D deletes the line indicated by the cursor. L loads data previously saved and S saves the data under the file name TAXFILE/DAT. P prints the file, without categorizing or summing, for archival or review purposes. Q returns you to Basic while R resumes the program where you left off. Y prints the summary and can be used at any time to let you see how you're doing.

The summarized data for the year to date appears in Fig. 3. (The example is entirely fictitious.)

Inside Taxman

I wrote this program with the help of subroutines from Lewis Rosenfelder's book *Basic Faster and Better*. They cut my programming and debugging time considerably. The book has line-by-line descriptions of the subroutines and machine-language programs used here.

In the Program Listing line 10 speeds up the program by assigning memory locations to the variables in order of frequency of use. Line 10 also specifies that each data line is 63 bytes long, that there is a limit of 200 lines, and that memory above -12600 is saved for storing the data. If you wanted to use a limit of 300 lines, LM should equal 300 and MB should equal -18900. The start of the search routine in line 180 would then change from CEC8 hexadecimal (hex) to B634 hex.

The program uses two machine-language routines. The first is Move Data, which is loaded in line 40 and called in line 7020. In line 7020 the From address is placed in array position US(1), the To address in US(3), the number of bytes to move in US(5), and the method—LDIR—in US(6). A move using the Z80 code LDDR would be represented by -18195 in US(6). The Move Data routine is also called in lines 8130, 8180, 8200, 8220, 8390, and 8410. In each case you need only specify the From and To addresses, the number of bytes, and the method used to move them. Like all of Rosenfelder's routines, it is fast.

The second machine-language program is a Search routine that loads into array SS in line 140. Taxman uses the array C to pass information to the Search routine; that is, the starting position of the search (CEC8 hex), the number of bytes per string (63), and the offset position in the string (3), as shown in line 180. The Search routine finds the search key string, SK\$, specified in lines 1000-1170.

The Search subroutine called in 2010 uses the information in line 2000 to

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FIRST NATIONAL BANK OF ANYWHERE		\$ 1234.50	
2ND NATIONAL BANK ACCT # 456789		\$ 98.78	
			SUBTOTAL = \$1,333.28

OTHER AND MISCELLANEOUS INCOME:			
			SUBTOTAL = \$0.00

*** TAX WITHHELD SUMMARY ***			
FEDERAL TAX WITHHELD:			
FEDERAL TAX		\$12345.67	
			SUBTOTAL = \$12,345.70

STATE TAX WITHHELD:			
STATE TAX		\$ 1234.56	
			SUBTOTAL = \$1,234.56

FICA (SOCIAL SECURITY) WITHHELD:			
FICA		\$ 2019.95	
			SUBTOTAL = \$2,019.95

*** SUMMARY OF DEDUCTIONS ***			
BUSINESS OR PROFESSIONAL DEDUCTIONS:			
TRS-80 MOD 3 TAX CALCULATING DEVICE		\$ 2295.00	
			SUBTOTAL = \$2,295.00

INTEREST (e.g. loan or mortgage) DEDUCTIONS:			
MORTGAGE: 1ST NAT'L BANK		\$ 1230.00	
CREDIT CARD REVOLVING CREDIT ACCT		\$ 1.23	
			SUBTOTAL = \$1,231.23

CHARITABLE CONTRIBUTIONS:			
THE CHARITY OF MY CHOICE		\$ 123.45	
SIGMA ALPHA EPSILON, INC		\$ 100.00	
ARRL DEVELOPMENT FUND		\$ 100.00	
			SUBTOTAL = \$323.45

DEDUCTIBLE TAXES (real estate, sales, etc.):			
CITY AND COUNTY REAL ESTATE TAXES		\$ 456.12	
SALES TAX ON 1982 MERCEDES-BENZ		\$ 1234.56	
			SUBTOTAL = \$1,690.68

MEDICAL EXPENSES:			
DR. CUTTER: CHOLECYSTECTOMY		\$ 456.12	
			SUBTOTAL = \$456.12

OTHER MISCELLANEOUS DEDUCTIONS:			
SUBSCRIPTION TO 80-MICROCOMPUTING		\$ 19.23	
OIL LEASING/DRILLING DEPLETION AL.		\$ 789.45	
			SUBTOTAL = \$808.68

Figure 3. Fictitious summarized data for year to date.

search for the first occurrence of SK\$, place the string in which it is found in temporary reserve in RE\$, and keep track of how many strings it is to search (LN). This useful Search routine rapidly accumulates the items and subtotals by category.

Lines 500-570 control the data input for each segment of the data line. This input technique is virtually foolproof since you can only enter an I or a D for

the first data item and a member of the set defined by AX\$ for other columns. You can enter only numeric data in the amount column.

Just about the only way you can bug this program is to start entering data without first loading the data already saved on disk. If you trust yourself to remember to load data each time you

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✓ 308

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- 1 Simulation 16K. From gambling to war games.

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 () 6 months \$95.70 (\$15.95 Per Month)
 () 12 months \$131.41 (\$10.95 Per Month)
 () Disk () Tape / () Model I
 () Model III

You may cancel your plan at any time and receive a full refund for all the months left. If the games are faulty return them and they will be replaced.

✓ 297

Program Listing. TAXMAN.BAS.

```
10 CLEAR2000:DEFINT A-Z:DIMAS,A,PO,ANS,LZ,PL,AL,LV,LT,LI,AX$,LE,LN
,J,X,MB,TTI,RES$,SK$,S,M$,LM,CN$,SG$,DS,AD$,AH$,US(7),SS(84),C(9):L
E=63:LM=200:MB=-12600:J=0:LI=384:LV=7:LZ=0:LN=0
40 SG$=STRING$(63,131):DEFFNCN$(A$,A)=STRING$(A/2-LEN(A$)/2-.5," "
)+A$:M$="$$$###,###.##":US(0)=8448:US(2)=4352:US(4)=256:US(7)=201:
DATA32717,-6902,-7715,20189,-8948,94,22237,6913,33,-13568,12345,64
01,1320,10731,6379,-5132
120 DATA28381,-8956,1382,-8935,4725,29917,-8941,4206,26333,17937,9
032,9054,-10922,-8763,94,22237:DATA-8959,2158,26333,-18679,21229,2
1560,28381,-8942,4966,24285,5646,6400,-11839,-14891,-16870,1568
140 DATA8979,-2032,8472,28381,-8960,358,-8925,117,29917,-8959,4718
,26333,-8941,3166,22,-8935:DATA4725,29917,6163,-8780,2670,26333,17
931,24285,-8942,4950,29475,29219,28381,-8960,358,1048:DATA46,38,-1
5935,-25917,10:FORX=0TO84:READSS(X):NEXT
180 C(2)=&HCEC8:C(6)=63:C(7)=3
200 CLS:POKE16420,1:PRINTFNCN$("TAXMAN",64):PRINTFNCN$(CHR$(239)+
"1982 by Robert Athanasiou, PhD, MD",64):PRINT:PRINT
210 PRINT"This program was built with the help of subroutines and
data handlers developed by Lewis Rosenfelder in his fascinating
book BASIC FASTER AND BETTER & OTHER MYSTERIES."
220 PRINT" published by IJG Inc. 1981, Upland CA.":PRINT:PRINTFNCN
$("PRESS ANY KEY TO CONTINUE",64):GOSUB6200
230 CLS:PRINT"To use the program follow the directions at the top
of the
screen and the prompts at the bottom. The <up-arrow> will send yo
u back a column to correct an error or move you to the commandmode
."
235 PRINT" In the COMMAND MODE, the <arrow>";
240 PRINT" keys will scroll the
data up or down the screen. Other commands are listed at the
bottom of the screen. When entering data, use the 2 letter codest
arting with an I for an INCOME item Or a D for a ";
250 PRINT" Deduction. Withholding and FICA are considered deductio
ns.
Press the <ENTER> key after each of the two letter codes then
you'll be ready to enter the source then the amount for the item"
260 PRINT:PRINT"A MAXIMUM OF 200 ITEMS MAY BE SAVED IN THE MEMORY
ALLOTTED":PRINT:PRINTFNCN$("PRESS ANY KEY TO CONTINUE...",64):GOSU
B6200:CLS:PRINTFNCN$("In the COMMAND mode:",64):PRINT
290 PRINT"<UP-ARROW> scrolls data up; <SHIFT><UP-ARROW> scrolls un
til
another key is pressed. <DOWN-ARROW> is similar.":PRINT
300 PRINT"<D> deletes a line, <I> inserts a line":PRINT:PRINT
"<L> and <S> load and save data to disk.":PRINT
310 PRINT"<R> resumes program, <Q> ends program and returns to BAS
IC":PRINT:PRINT"<P> prints the data for hard copy storage or check
ing.":PRINT
320 PRINT"<Y> invokes the subroutine that sums the tax categories
and
prints a copy for your accountant or form 1040.":PRINTFNCN$("
PRESS ANY KEY TO BEGIN PROGRAM",64):GOSUB6200
400 CLS:PRINT"ENTER ITEMS USING THESE CATEGORIES: W = Wages, S = S
tate w/held":PRINT"F = Fed w/held, E = FICA(Soc.Sec), B = Bus/Prof
, I = Interest.":PRINT"D = Dvdnd, C = Contrib, T = Taxes, M = Medi
cal, O = Other":PRINTSG$:PRINT@832,SG$
410 PRINT@256,"CODE/CAT";TAB(16)"DATE & SOURCE OF INC OR DED";TAB(
48)"AMOUNT":PRINT@320,SG$:GOSUB8000:GOTO200
500 PRINT@896,CHR$(31);"<ENTER> CODE then <ENTER> CATEGORY... I =
INCOME, D = DEDUCTION ** press <up-arrow> to go to COMMAND mode.
...":IFDS=0GOTO8240
510 LT=3:AL=1:GOSUB7000:AX$="ID":PRINTCHR$(30);:GOSUB6000:LT=4:AL=
1:GOSUB7000:AX$="WSEFIDCTMO":PRINTCHR$(30);:GOSUB6000:IFA$=CHR$(9
1)THENRETURN
520 PRINT@896,CHR$(31);"ENTER THE SOURCE OF INCOME OR DEDUCTION
** press <up-arrow> to go BACK one column":LT=10:AL=36:GOSUB700
0:AX$=" I#$&() *+,-,./,:@<>?ABCDEFGHIJKLMNPOQRSTUVWXYZ1234567890"
:GOSUB6000:IFA$=CHR$(91)THEN500
540 PRINT@896,CHR$(31);"ENTER AMOUNT without using the dollar sign
** press <up-arrow> to go BACK one column":LT=48:AL=8:GOSUB7000
:GOSUB6100:IFA$=CHR$(91)THEN520
560 IFVAL(AN$)>99999THEN540
570 RETURN
1000 CLS:LINEINPUT"ENTER DATE OF THIS SUMMARY ";AD$:LINEINPUT"ENT
ER HEADING FOR THIS SUMMARY ";AH$:LPRINTFNCN$(AH$,80):LPRINTFNCN$
(AD$,80):LPRINT:LPRINTSTRING$(79,"*"):LPRINT"INCOME FROM WAGES":S
K$="IW":GOSUB2000
1040 LPRINT"BUSINESS OR PROFESSIONAL INCOME":SK$="IB":GOSUB2000:L
PRINT"DIVIDEND INCOME FROM INVESTMENTS":SK$="ID":GOSUB2000:LPRINT
"INTEREST INCOME (FROM SAVINGS)":SK$="II":GOSUB2000
1070 LPRINT"OTHER AND MISCELLANEOUS INCOME":SK$="IO":GOSUB2000:L
PRINTFNCN$("*** TAX WITHELD SUMMARY ***",80):LPRINT:LPRINT"FE
DERAL TAX WITHELD":SK$="DF":GOSUB2000:LPRINT"STATE TAX WITHELD":
SK$="DS":GOSUB2000
1110 LPRINT"FICA (SOCIAL SECURITY) WITHELD":SK$="DE":GOSUB2000:L
PRINTFNCN$("*** SUMMARY OF DEDUCTIONS ***",80):LPRINT:LPRINT"
```

Listing continued


```

BUSINESS OR PROFESSIONAL DEDUCTIONS:"SK$="DB":GOSUB2000
1140 LPRINT"INTEREST (e.g. loan or mortgage) DEDUCTIONS:"SK$="DI"
:GOSUB2000:LPRINT"CHARITABLE CONTRIBUTIONS:"SK$="DC":GOSUB2000:LPRINT"DEDUCTABLE TAXES (real estate, sales, etc.):SK$="DT":GOSUB2000
1170 LPRINT"MEDICAL EXPENSES:"SK$="DM":GOSUB2000:LPRINT"OTHER MISCELLANEOUS DEDUCTIONS:"SK$="DO":GOSUB2000:GOTO400
2000 C(0)=1:TTI=0:RES=STRING$(63," "):C(4)=LN:C(5)=VARPTR(RES):C(8)=VARPTR(SK$)
2010 DEFUSL=VARPTR(SS(0)):J=USRL(VARPTR(C(0))):IFJ=0GOTO2050
2030 LPRINTTAB(5)RIGHT$(RES,53):TTI=TTI+VAL(RIGHT$(RES,14)):IFC(0)<LNTHENC(0)=C(0)+1:GOTO2010
2050 LPRINTTAB(50)"SUBTOTAL = ":LPRINTUSINGM$;TTI:LPRINTSTRING$(79,"-"):LPRINT:RETURN
3000 IFDS=0THENEND
3010 CLS:PRINT@64,FNCN$("> YOU HAVE DATA IN RAM ! <=",64):PRINT"ENTER <S> TO SAVE THE DATA
ENTER <R> TO RETURN TO THE PROGRAM
ENTER <QUIT> TO END WITHOUT SAVING THE DATA":PRINT:INPUTAQ$
3040 AQ$=LEFT$(AQ$,1):ONINSTR("SRQ",AQ$)GOTO320,400,3050:GOTO3010
3050 CLS:PRINT@384,FNCN$("OK !",64):END
4000 LZ=0:PRINTLI,CHR$(30);STRING$(LV-1,13);:LT=1:GOSUB7010:GOSUB830:AL=63:GOSUB5000:LPRINTANS:IFLZ=LNTHEN8040ELSELZ=LZ+1:GOTO2030
5000 AN$=" ":POKEVARPTR(AN$),AL:POKEVARPTR(AN$)+2,INT(PO/256)+60:P
OKEVARPTR(AN$)+1,PO-INT(PO/256)*256:RETURN
6000 A=0:PRINT@PO,STRING$(AL,95);
6010 IFA=ALTHEN6040ELSEPRINT@PO+A,CHR$(95);
6020 AS=INKEY$:IFA$=" "THEN6020ELSEIFINSTR(AX$,AS)THENPRINT@PO+A,AS;A=A+1:GOTO6010
6030 ONINSTR(CHR$(8)+CHR$(31)+CHR$(13)+CHR$(91),AS)GOTO6050,6000,6080,6070:GOTO6010
6040 AS=INKEY$:IFA$=" "THEN6040ELSE6030
6050 IFA<ALTHENPRINT@PO+A,CHR$(95);
6060 A=A-1:IFA<0THENA=0:GOTO6010ELSE6010
6070 A=0
6080 IFA$=CHR$(91)THENPRINT@PO,STRING$(AL,95);ELSEPRINT@PO+A,STRING$(AL-A," ");
6090 GOSUB5000:RETURN
6100 S=1:AN$=" ":PRINT@PO,"$";STRING$(AL,95);" ";:PRINT@PO+AL-2,"."
;
6110 AS=INKEY$:IFA$=" "THEN6110ELSEIFINSTR("0123456789",AS)THEN6130ELSEONINSTR("-"+CHR$(8)+CHR$(31)+CHR$(13)+CHR$(91),AS)GOTO6150,6100,6100,6170,6160
6120 GOTO6110
6130 AN$=AN$+AS:IFLEN(AN$)=1THENAN$=CHR$(95)+AN$ELSEIFLEN(AN$)>AL-1THENAN$=LEFT$(AN$,AL-1)ELSEIFLEN(AN$)=3ANDLEFT$(AN$,1)=CHR$(95)THENAN$=RIGHT$(AN$,2)
6140 PRINT@PO+AL-LEN(AN$),LEFT$(AN$,LEN(AN$)-2);". ";RIGHT$(AN$,2);:GOTO6110
6150 S=-S:PRINT@PO+AL+1,"";:IFS=-1THENPRINT"-";:GOTO6110ELSEPRINT" ";:GOTO6110
6160 IFA$=CHR$(91)THENPRINT@PO+1,STRING$(AL,95);" ";:PRINT@PO+AL-2," ";:GOTO6190ELSEPRINT@PO,STRING$(AL+2," ");:GOTO6190
6170 IFLEN(AN$)=0THENPRINT@PO,STRING$(AL+2," ");:GOTO6190ELSEPRINT@PO+1,STRING$(AL-1-LEN(AN$)," ");:IFLEFT$(AN$,1)=CHR$(95)THENPRINT@PO+AL-1,"0";:MID$(AN$,1,1)="0"
6180 AN$=MID$(AN$,1,LEN(AN$)-2)+". "+RIGHT$(AN$,2):IFS=-1THENAN$="-"+AN$
6190 RETURN
6200 AS=INKEY$:IFA$=" "THEN6200ELSERETURN
7000 IFLZ>LV-1THENPL=LI+(LV-1)*64:PO=PL+LT:PRINT@PO,"";:RETURNELSEPL=LI+LZ*64:PO=PL+LT:PRINT@PO,"";:RETURN
7010 IFLZ<LVTHENGOSUB7000:RETURNELSEJ=0
7020 US(1)=15424+LI:US(3)=15360+LI:US(5)=(LV-1)*64:US(6)=-20243:DEFUSR=VARPTR(US(0)):J=USR0(0):GOSUB7000:PRINT@PL,CHR$(30);:RETURN
8000 GOSUB5000
8010 IFA$="["THENPRINT@PL,CHR$(30);:GOSUB8370:GOSUB8040:IFA$="E"THENRETURNELSE8030
8020 GOSUB8370:LZ=LZ+1:LN=LZ:GOSUB7010
8030 IFLN<LNTHEN8000ELSEPRINT@896,CHR$(31);"LIMIT OF";LM;" ENTRIES HAS BEEN REACHED.
PRESS <ENTER>...":GOSUB6200:AS$="["GOTO8010
8040 PRINT@896,CHR$(31);"<P>PRINT FILE <L>LOAD FROM DISK <R>RESUME <Q>QUIT
<D>DELETE <I>INSERT <S>SAVE ON DISK <Y>YTD SUMMARY";
8050 GOSUB8490:GOSUB6200:GOSUB8500
8060 A=INSTR(CHR$(91)+CHR$(10)+CHR$(27)+CHR$(26)+"RPIDLSYQ",AS):ONAGOTO8080,8090,8100,8110,8120,4000,8130,8200,8240,8320,1000,3000:GOTO8050:RETURN
8080 GOSUB8400:IFPEEK(14591)>0THEN8080ELSE8050
8090 GOSUB8500:GOSUB8460:GOSUB8490:IFPEEK(14591)>0THEN8090ELSE8050
8100 GOSUB8500:GOSUB8400:GOSUB8490:AS=INKEY$:IFA$=" "THEN8100ELSE8060
8110 GOSUB8500:GOSUB8460:GOSUB8490:AS=INKEY$:IFA$=" "THEN8110ELSE8060
8120 IFLZ=LNTHENGOSUB8500:RETURNELSEGOSUB8460:GOTO8120

```

Listing continued

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Listing continued

```
8130 IFLN>=LMTHEN8120ELSEGOSUB8500:IFPL<>LI+LV*64-64THENUS(1)=1536
0+LI+LV*64-65:US(3)=US(1)+64:US(5)=(LI+LV*64-64)-PL:US(6)=-18195:J
=USR(0)
8140 PRINT@PL,CHR$(30);:GOSUB500:IFAS<>"["THEN8180ELSEIFPL<>LI+LV*
64-64THENUS(1)=PL+15360+64:US(3)=US(1)-64:US(6)=-20243:J=USR(0)
8160 J=LZ:AL=PL:LZ=LZ+((LI+LV*64-64)-PL)/64:PL=LI+LV*64-64:IFLZ>LN
THENPRINT@PL,CHR$(30);ELSEGOSUB8380
8170 LZ=J:PL=AL:GOTO8040
8180 US(1)=LN*LE+LE+MB:US(3)=US(1)+LE:US(5)=(LN-LZ)*LE+LE:US(6)=-1
8195:J=USR(0):LN=LN+1:GOSUB8370:GOSUB8460:GOTO8040
8200 IFLZ=LNTHEN8050ELSEIFPL<>LI+LV*64-64THENUS(1)=PL+15424:US(3)=
US(1)-64:US(5)=(LI+LV*64-64)-PL:US(6)=-20243:DEFUSR0=VARPTR(US(0))
:J=USR0(0)
8210 J=LZ:AL=PL:LZ=LZ+((LI+LV*64)-PL)/64:PL=LI+LV*64-64:IFLZ>LNTH
NPRINT@PL,CHR$(30);ELSEGOSUB8380
8220 LZ=J:PL=AL:US(1)=MB+1+LZ*LE+LE:US(3)=US(1)-LE:US(5)=(LN-LZ)*L
E:DEFUSR0=VARPTR(US(0)):J=USR0(0):LN=LN-1:GOTO8050
8240 IFDS=1THENGOTO3010ELSELZ=0:LN=0:DS=1:PRINT@LI,CHR$(30);STRING
$(LV-1,13);:PRINT@896,CHR$(31);"LOADING FROM DISK...";
8250 ONERRORGOTO8300:OPEN"1",1,"TAXFILE/DAT":ONERRORGOTO0
8260 IFEOP(1)THEN8290ELSELINEINPUT#1,ANS
8270 LT=1:GOSUB7000:PRINTANS;:GOSUB8370:LZ=LZ+1:GOTO8260
8290 CLOSE:LZ=LZ-1:LN=LZ:GOTO8040
8300 LZ=0:LN=0:RESUME8040
8320 LZ=0:DS=0:PRINT@LI,CHR$(30);STRING$(LV-1,13);:PRINT@896,CHR$(
31);"SAVING ON DISK...";:OPEN"0",1,"TAXFILE/DAT"
8340 LT=1:GOSUB7010:GOSUB8380:AL=LE:GOSUB5000:PRINT#1,ANS:IFLZ=LNT
HENCLOSE1:GOTO8040ELSELZ=LZ+1:GOTO8340
8370 US(1)=PL+15361:US(3)=LZ*LE+MB+1:US(5)=LE:US(6)=-20243:GOTO839
0
8380 US(1)=LZ*LE+MB+1:US(3)=PL+15361:US(5)=LE:US(6)=-20243:GOTO839
0
8390 A=0:DEFUSR0=VARPTR(US(0)):A=USR0(0):RETURN
8400 GOSUB8500:LZ=(LZ-1)*-((LZ-1)>0):IFLZ<LV-1THEN8450
8410 US(1)=15360+LI+LV*64-65:US(3)=US(1)+64:US(5)=(LV-1)*64:US(6)=
-18195:DEFUSR0=VARPTR(US(0)):J=USR0(0):J=LZ:LZ=LZ+1-LV:PL=LI:GOSUB
8380:LZ=J
8450 GOSUB8490:RETURN
8460 LZ=LZ+1:IFLZ>LNTHENLZ=LN:RETURNELSEIFLZ<LVTHEN8480ELSEGOSUB70
20:PL=LI+LV*64-64
8470 GOSUB8380
8480 RETURN
8490 GOSUB7000:PRINT@PL,CHR$(62);:RETURN
8500 GOSUB7000:PRINT@PL," ";:RETURN:END
```

Continued from p. 101

use the program, delete this from line 500:

```
:IF DS=0 GOTO 8240
```

After you load the data, press R and begin adding new data. Lines 3000-3050 try to keep you from exiting the program before saving your data.

After you have the program running, you can save space and speed up the program by removing the blanks and REMs and combining lines.

Rosenfelder's subroutines are available on disk and are a great buy for the serious programmer. His book and the disks are available from IJG Inc., 1260 West Foothill Blvd., Upland, CA 91786 and several mail-order houses. Radio Shack offers the book but not the disks. ■

Contact Robert Athanasiou at 13 Lawnridge Ave., Albany, NY 12208.

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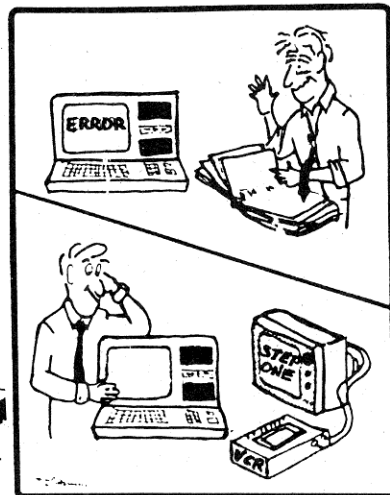
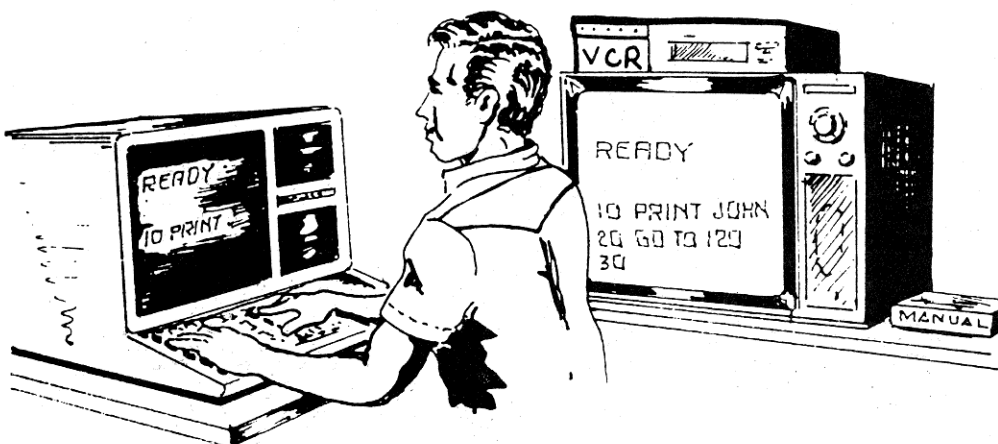
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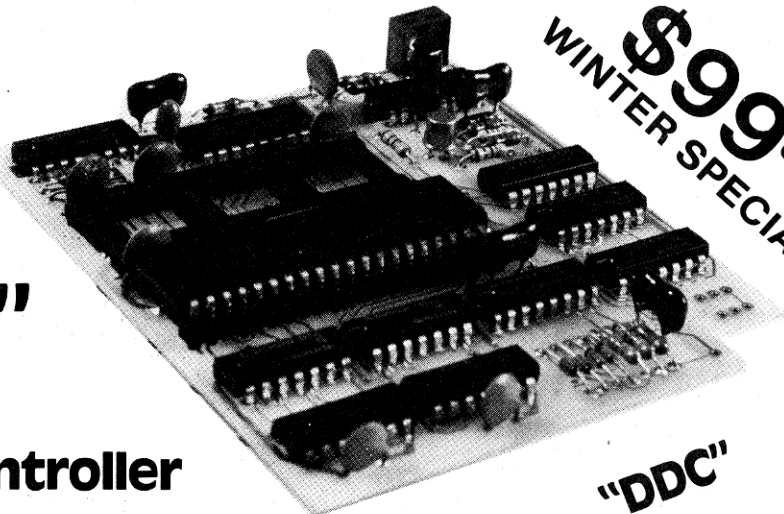
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MFR & PRODUCT	SECTORS LOCKED OUT (AVG)
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PERCOM "DOUBLER II"	18
PERCOM "DOUBLER A"	250
LNW "LNDOUBLER"	202

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MFR. & PRODUCT	SECTORS LOCKED OUT	
	WITHOUT "DDS"	WITH "DDS"
PERCOM "DOUBLER II"	18	1
PERCOM "DOUBLER A"	250	0
LNW "LNDOUBLER"	202	0

Note: Same test procedures as "DDC".
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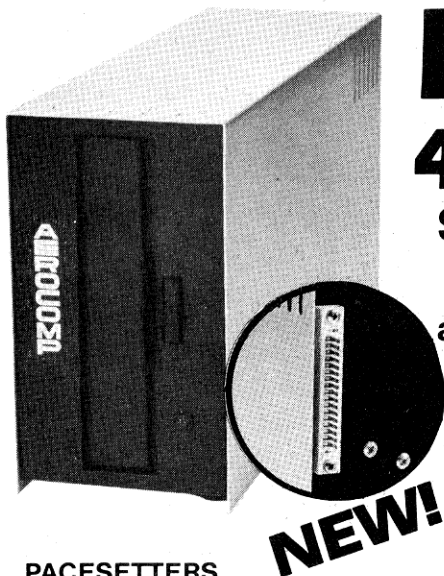
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by Charles R. Perelman

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MicroPro International has bundled some of its most popular and valuable word processing programs into a multifaceted package. WordStar Professional consists of WordStar 3.30, MailMerge 3.30, SpellStar 3.30, and StarIndex 1.01. It's a reasonably well-integrated package and, despite its high cost, I think it's worthwhile for both the student and the professional writer.

Installation is menu driven and the programs support most printers. You can select WordStar, MailMerge, and SpellStar from the main menu by pressing a single key. StarIndex is an entirely separate program.

WordStar 3.30

The star of this package is still WordStar, one of the top micro word processors. You get a full panoply of features that give you an almost exact screen preview of the way your text prints out.

Cursor movement and scrolling occur in all directions and include single row or column changes, jumps to the beginning or end of a document, and automatic horizontal scrolling of up to 240 characters. Insert, delete, find, re-

place, and a good range of block functions perform traditional roles.

You can repeat many commands continuously, and you have sophisticated wildcard and global search and replace options. This latest WordStar is noticeably faster than prior releases.

Extensive formatting choices control top, bottom, right, and left margins, tabs, justification, hyphenation, line spacing, single line headers and footers, and page length. If your printer supports bidirectional printing, boldface, double strike, underline, strikeout, strikeover, subscript, superscript, varied character pitch, and line height, WordStar provides these functions through commands you enter in the margins or embed in your document.

Column manipulations and decimal tabs aid your preparation of tables or newsletter-style text.

File commands let you write portions of a file to a new file or insert an entire external file into your current work. Without terminating your edit, you can access the WordStar directory, copy a different file even to another disk, rename, or delete another file.

Theoretically you can print out one file while editing another, but the spooling is partial. Rapidly entering new text interrupts the printer.

Directory displays don't show files with extensions of COM, HEX, SYS, OVR, REL, and \$\$\$; this eases scanning the directory to locate a text file. Since StarIndex doesn't appear in the main menu and all but one of its files

have nondisplay extensions, it's disconcerting not to find an indication of its existence in the WordStar directory.

A document file's length is limited only by disk size with virtual memory techniques. Working file requirements, retention of your original file with a BAK extension, and space for program software on the same disk reduce available space but it's more than sufficient under ordinary circumstances.

One major failing of WordStar is its limited recovery procedures for disk full errors. Saving text at regular intervals is good insurance. MicroPro has numerous reminders throughout the documentation about checking disk space.

WordStar contains good Help screens and brief lists of major commands. You can speed program operation by changing help levels and eliminating some displays as you become more proficient.

The technical manual is free to direct dealers or \$50 to end users. It includes answers to commonly asked questions about WordStar and other MicroPro products, patches for specialized printer needs and unusual installation configurations, and an explanation of the label patcher.

If you have problems applying the technical manual data, telephone the technical hot line. Try to solve your enigma with the manual first, since MicroPro has a large user base and the hot line is frequently busy.

WordStar 3.30's documentation is awesome. The command card for WordStar is logically organized and easy to use. A similar card for MailMerge, SpellStar, and StarIndex gives pertinent data at a quick glance. The documentation includes adhesive labels imprinted with control characters.

The new WordStar manual is attrac-

tively printed on 6- by 9-inch sheets, and comes in a three-ring binder with a jointed cover. Tabs divide major sections. The text is well illustrated, and examples of screen prompts and document output are clear.

The manual breaks involved procedures into numbered steps and describes each in detail. Cross-referencing for related information, an index, a table of contents, and a flowchart guide further enhance the documentation.

A training guide contains 20 lessons divided into three word processing courses at different levels of proficiency. The lessons are readable, logically ordered and grouped, and easy to follow.

WordStar isn't perfect. If you have heavy continuous word processing demands, consider a hardware spooler; concurrent editing and printing operate at a snail's pace. You cannot move to a particular page by number, but you can place up to 10 markers in a document for quick movement during editing.

If you're not using the defaults, you must reset margins, line spacing, justification, and so on each time you edit. Also, WordStar does not support true proportional printing, although microjustification produces good justified printing.

WordStar doesn't implement glossary features. You can save a single heading or text selection in a separate file and read in as many of these files as you want, but this isn't as effective as a true glossary.

You don't have split screen capability for working on multiple files. Multiple line headers and footers aren't provided. You can't print the file you're editing or any part of it interactively; you must close it first.

In fairness, I don't know of a micro word processor that has all these features as well as those WordStar offers. WordStar remains a premier accomplishment, and I thoroughly enjoy using it.

MailMerge 3.30

MailMerge is a versatile WordStar adjunct. The new ability to match specific sections of a master document to data from a list meeting selected criteria, described as conditional printing, is a very powerful feature.

You prepare your master (e.g., a form letter) with WordStar. Commands preceding the text identify the data file and variables you want merged. In the body of the form, the program delineates generic variable names with ampersands. At run time,

actual list data replaces the variables and MailMerge reforms paragraphs to fit the inserts.

Other MailMerge techniques permit individual determination of variables for insertion. For example, you can prompt the operator for variables on each printout (different addresses for a form letter), or, at the beginning of a file, you can quickly set variables that appear repeatedly throughout a document (the names of parties in a contract, for example).

An alternate method uses a command file like those used in editing macros, but this one is easier. You build up each task with commands, directing access to various text and data files as needed. When run, the program extracts text and data from the different files as required.

You design on-screen prompts for entering variables, inserting paper or envelopes, or changing disks. You can chain or nest files to use boilerplate provisions or to join related text for continuous page numbering.

*“WordStar remains a
premier accomplishment,
and I thoroughly
enjoy using it.”*

Run-time print options on the MailMerge menu are similar to those on WordStar, letting you start or stop printing at any page of the document, print continuous or single-sheet documents, and print multiple copies. If you start MailMerge after the first page of a data file, be prepared to wait as it cycles through each data item prior to your starting page.

I've saved the best for last. Conditional printing gives you some facilities of a data-base management system. You can choose different text paragraphs to match to particular elements of your data file.

You can compare any variable from your data file to alphabetic or numeric expressions based on ASCII values by using equal, greater than, less than, And, and Or delimiters. You can use up to 100 characters in a conditional command.

The result of the comparison then branches the program using If...Then or Except...Then construction. The possibilities are practically limitless,

especially when you add special variables to your data file as sorting or identifier keys.

Since MailMerge uses dot commands of the same type as WordStar and you use WordStar to edit files you want merged, you need prior exposure to WordStar to feel comfortable with MailMerge. The WordStar nondocument mode used for this purpose might be alien to many users.

The documentation is well-done and packaged similarly to WordStar's. It's nicely printed with plenty of graphics, a table of contents, an index, flowcharts, and an excellent discussion of errors and warning messages.

As a bonus, Appendix C contains details on some worthwhile applications. With the four tutorial lessons on MailMerge procedures contained in the WordStar manual, you get excellent samples of MailMerge's capabilities.

SpellStar 3.30

You call SpellStar from WordStar's main menu. Sufficient disk space can be a problem, since you need work file space equal to your original file. The main 20,800-word SpellStar dictionary takes approximately 96K and the overlay (COM) file takes 18K.

Starting your spelling check is cumbersome. After answering a prompt for file name, you must go through two submenus, choose proofing as opposed to dictionary maintenance, set up a main dictionary, and possibly set up an optional dictionary containing specialized terms.

While processing your text, the program updates various statistics such as number of words in the document, words in dictionaries used, and words not recognized. The original SpellStar dictionary does not recognize some common words, such as *tabs*, *cursor*, and *nicely*. The *ly* suffix seems to generate misspelling indicators.

The next step processes the file by marking all unrecognized words. Finally, you move through the file electing whether to edit a marked word, ignore it, pass it for later review, or add it to one of the dictionaries.

SpellStar retains ignore and add-to-dictionary instructions for about the last 15 words, and handles subsequent appearances of any of these words in the same way. In a long document you might rework the same word many times. You make revisions in context as you skim through the document.

Dictionary maintenance lets you create a main or supplemental dictionary, add or delete words, or format a

purchased dictionary. It's possible to list a dictionary's contents on the screen, but you can't print them. The use of customized supplemental dictionaries is valuable and reduces unrecognized words, particularly in specialty areas.

The SpellStar manual is consistent in format with the other programs and contains an index, table of contents, and flowcharts. Presentation of material is not as cogent, perhaps because this is not as mature a product.

Enumerated steps for functions such as creating a dictionary would be helpful. The last two chapters of the WordStar training guide lead you through SpellStar procedures to give you a working knowledge of the system.

Overall SpellStar is unwieldy and slow. It also requires an inordinate amount of disk space for a main dictionary that doesn't recognize many common words. SpellStar has an abundance of handy features, but it takes too many steps to accomplish normal functions.

StarIndex 1.01

StarIndex is an orphan. Unless you know that Format.FMT is a StarIndex file, no sign of it appears in the WordStar directory display. The training guide doesn't offer any lessons in its use.

To access StarIndex with the Run command from WordStar's main menu, you must remember the COM file name (STARINDEX) and the syntax. In spite of its neglect, the software is tremendously useful.

StarIndex produces alphabetical indexes, tables of contents, lists of figures and tables, and outlines, with a minimum of hassle.

Creating an index is an extension of the basic WordStar philosophy using embedded print controls and dot commands. You must prepare the file with WordStar before creating the index.

Using WordStar's Find command, you locate and mark any word in your text that you want to appear in your index. If you use the global Find and Replace command with the word surrounded by print control markers, the program rapidly indexes every repetition. StarIndex recognizes the MailMerge command for calling an external file, letting you create a single index for material in multiple files.

With dot commands you can insert a descriptive index item, such as a synonym or classification that doesn't appear in the text, for any page. You designate references as master (main

headings printed in boldface) or general.

You can list subentries or detailed classifications beneath each reference. After running StarIndex, you can edit the output files.

StarIndex has only one print format, a single-column index without any title. Judicious editing with WordStar aligns two index columns to a page, and you

"MailMerge's conditional branching opens up new applications and StarIndex adds a helpful dimension."

can insert titles, such as INDEX, as headers.

STARINDEX.COM and its related files occupy about 56K of RAM. Check disk space before running StarIndex since the program produces three output files: another text file implementing the StarIndex commands, the table of contents, and the index files. All three combined take up somewhat more space than your unprocessed text file.

You use dot commands to produce a table of contents with a main level, up to three subsidiary levels, and separate lists of figures and tables. The program uses the same numbering system in the body of your document as in the table of contents.

Ignoring the table of contents, you can use this system to create outlines or contracts with sequential subdivision numbering. Headings or captions for figures or tables are limited to one line, but you can edit the resulting text and table of contents files to lengthen the captions.

The real versatility of StarIndex is in the options available for making your own default file and altering formats with dot commands. Style, a menu-driven utility, lets you create new patterns to replace Format.FMT. A format file gives consistency to your documents, but doesn't place directives in the text file.

Inserted dot commands override default settings from format files. If you turn off format file print controls and enter all parameters in the text file, you get a picture of the formatting in the text file, but you increase editing time.

Boldface, double strike, elongation, underlining, and insertion of spaces are print control options.

Numbering choices include combinations of upper- and lowercase Roman numbers, Arabic numbers, upper- and lowercase letters, and no numbering for main headings. You can't use Roman numerals for subsections.

Many other options are available for formatting your index, numbering pages, inserting blank pages, and so on.

Clarity and completeness of the manuals need improvement. The form is the same as that of the other programs in this package.

Appendix B (error messages) is rather terse for a beginner. Other appendixes contain a command list, an explanation of StarIndex work files, and a set of documents for the sample file included on your distribution disk.

Prior experience with WordStar is a must for thoroughly understanding the manual and program. Take MicroPro's advice and experiment with the sample file.

The documentation is good, but not as all-inclusive as that for WordStar. A discussion of the structure of StarIndex output files with TOC (Table of Contents), SI (text with print controls), and IDX (Index) extensions and of editing those files is conspicuously absent.

StarIndex integrates nicely with the balance of the WordStar Professional package. It would be more convenient if it were selectable from the main menu and prompted for input and output files.

Other enhancements I'd appreciate include the ability to enter cross references in an index without page numbers, to eliminate the periods and page numbers in a table of contents, to change the periods to other characters, to put parentheses around second and subsequent subdivision characters, to put descriptive headers preceding numbers, and to have more subdivision levels.

Summary

WordStar Professional offers a broad range of valuable word processing features. Overall, it's a quality package, with SpellStar its weakest link. On the plus side, MailMerge's conditional branching opens up new applications and StarIndex adds a helpful dimension. All in all, I recommend it for anyone who has to do a lot of writing. ■

Write Charles Perelman at 1800 Century Park East 1150, Los Angeles, CA 90067.

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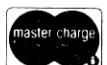
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change, or back up machine-language tapes.

To solve this problem, I bought an assembler and wrote a Model I/III utility called Tapetility that not only backs up machine-language tapes, but provides many other features. Tapetility

loads machine-language tapes into memory, tests them, writes new ones to tape, verifies the new tape with the code in memory, executes loaded programs, edits tapes, and searches through a tape for a specified program.

Using combinations of these features, you can change tape speed, name, and/or contents, identify program names and their load execution addresses, and generate machine-language tapes of programs you write.

Running the Program

Since many people are unfamiliar with assemblers, I converted Tapetility's machine code to Basic data statements. This lets anyone who can type a simple Basic program use Tapetility. The Basic listing reads the data and then POKES it back into memory (see Program Listings 1, 2, and 3). This takes about 15 seconds, after which you're prompted to execute the program by pushing the break key.

After you type in the utility but before you run it, make sure you save it in case you make a mistake. If you do make an error, you'll have to start all over again since there's no way to get back the Basic listing.

Once you boot up the utility, you can discard the Basic listing after you use the utility to make a copy of itself. The

Continued on p. 116

Program Listing 1. Tape16.

```

10 CLS
20 PRINT "TAPE16 MACHINE LANGUAGE POKE ROUTINE- BY DAVE TRAPASSO"
30 POKE 16561,255:POKE 16562,123:CLEAR 10
40 PRINT "MEMORY SIZE IS NOW SET TO PROTECT THE MACHINE LANGUAGE R
OUTINE"
50 PRINT "PROGRAM LOADS AT HEX 7C00-7FEF (31744-32751 DECIMAL)
60 PRINT "CAUTION: MAKE SURE YOU SAVE THE BASIC PROGRAM BEFORE RUN
NING"
70 PRINT "WAIT ABOUT 15 SECONDS FOR THE POKE ROUTINE":S=0
80 FOR I=31744 TO 32751
90 READ A:POKE I,A:S=S+A:NEXT I
95 PRINT "THE SUM OF YOUR DATA STATEMENTS IS: ";S;"", IT SHOULD BE
108701"
96 IF S<> 108701 THEN STOP
100 REM- SET UP THE BREAK KEY VECTOR TO JUMP TO THE START OF THE P
ROGRAM
110 POKE 16396,195: POKE 16397,0: POKE 16398,124
120 INPUT "HIT THE BREAK KEY TO TO RUN":A$
130 PRINT "YOU HIT A KEY OTHER THAN BREAK":STOP
10000 DATA49,125,64,205,248,1,205,201,1,33
10010 DATA59,127,205,105,125,62,195,50,12,64
10020 DATA33,0,124,34,13,64,33,3,66,54
10030 DATA195,35,54,12,35,54,64,6,64,62
10040 DATA95,205,53,127,16,249,33,98,127,205
10050 DATA105,125,6,1,33,252,127,229,205,64
10060 DATA0,225,126,254,87,202,122,125,254,74
10070 DATA202,46,127,254,69,202,166,126,254,84
10080 DATA40,8,254,86,40,4,254,76,32,203
10090 DATA35,54,170,205,128,126,205,147,2,205
10100 DATA53,2,254,85,32,249,33,249,63,17

```

Listing 1 continued

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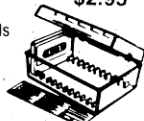
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10110 DATA246,127,6,6,205,53,2,119,18,19
10120 DATA35,16,247,205,53,2,254,60,32,249
10130 DATA205,53,2,71,205,20,3,34,244,127
10140 DATA24,21,205,157,126,205,53,2,254,120
10150 DATA40,116,254,60,32,242,205,53,2,71
10160 DATA205,20,3,77,124,129,79,205,148,126
10170 DATA205,53,2,95,58,252,127,254,84,40
10180 DATA39,254,86,40,62,213,229,235,33,0
10190 DATA124,237,82,56,4,225,209,24,17,63
10200 DATA235,43,17,255,127,237,82,48,242,62
10210 DATA0,50,253,127,24,235,56,2,123,119
10220 DATA123,129,79,35,16,197,205,53,2,185
10230 DATA40,166,205,248,1,33,216,127,205,105
10240 DATA125,205,118,125,195,37,124,126,187,40
10250 DATA225,34,244,127,205,248,1,33,225,127
10260 DATA17,245,127,205,115,125,24,229,43,34
10270 DATA242,127,205,20,3,34,240,127,205,248
10280 DATA1,33,155,127,17,245,127,205,115,125
10290 DATA33,170,127,17,243,127,205,115,125,33
10300 DATA183,127,17,241,127,205,115,125,58,253
10310 DATA127,254,170,40,185,33,232,127,205,105
10320 DATA125,24,174,213,205,105,125,225,205,80
10330 DATA125,43,205,80,125,201,126,15,15,15
10340 DATA15,205,89,125,126,230,15,198,48,254
10350 DATA58,56,2,198,7,195,53,127,33,148
10360 DATA127,126,254,0,200,205,53,127,35,24
10370 DATA246,205,67,125,62,13,24,233,205,102
10380 DATA125,33,198,127,205,105,125,6,6,33
10390 DATA246,127,229,229,126,8,205,64,0,225
10400 DATA126,254,13,32,4,8,119,24,9,205
10410 DATA35,126,205,27,126,205,43,126,205,128
10420 DATA126,205,132,2,62,85,205,100,2,6
10430 DATA6,225,126,205,100,2,35,16,249,42
10440 DATA242,127,237,91,244,127,237,82,35,36
10450 DATA205,157,126,37,40,12,62,60,205,100
10460 DATA2,62,0,205,1,126,24,238,175,189
10470 DATA40,9,62,60,205,100,2,125,205,1
10480 DATA126,62,120,205,100,2,33,240,127,126
10490 DATA205,100,2,35,126,205,100,2,205,248
10500 DATA1,195,37,124,205,100,2,245,205,148
10510 DATA126,241,201,205,248,125,71,123,205,248
10520 DATA125,122,205,248,125,131,79,26,205,248
10530 DATA125,129,79,19,16,247,121,24,221,33
10540 DATA170,127,17,243,127,24,14,33,155,127
10550 DATA17,245,127,24,6,33,183,127,17,241
10560 DATA127,213,229,205,102,125,225,205,105,125
10570 DATA33,252,127,229,6,4,205,64,0,225
10580 DATA209,205,76,126,205,76,126,201,205,93
10590 DATA126,56,41,205,116,126,205,93,126,56
10600 DATA33,129,18,27,201,126,35,254,71,48
10610 DATA15,254,48,216,254,58,56,5,254,65
10620 DATA216,198,9,230,15,55,63,201,7,7
10630 DATA7,7,79,201,225,225,43,43,43,233
10640 DATA58,147,2,238,205,40,3,205,66,48
10650 DATA243,33,133,127,205,105,125,195,73,0
10660 DATA58,64,56,230,4,194,12,64,201,58
10670 DATA62,60,238,10,50,62,60,201,205,35
10680 DATA126,205,118,125,205,4,127,205,236,126
10690 DATA33,252,127,229,6,2,205,64,0,225
10700 DATA126,254,10,40,49,254,91,40,30,254
10710 DATA13,40,21,5,40,14,205,93,126,56
10720 DATA216,205,116,126,205,93,126,56,208,129
10730 DATA42,244,127,119,205,38,127,24,201,42
10740 DATA244,127,43,34,244,127,24,192,33,145
10750 DATA127,195,105,125,205,4,127,205,43,0
10760 DATA254,0,32,173,205,38,127,205,118,125
10770 DATA24,238,33,245,127,205,72,125,205,236
10780 DATA126,42,244,127,229,126,254,32,56,4
10790 DATA254,128,56,2,62,46,205,53,127,205
10800 DATA236,126,225,195,80,125,42,244,127,35
10810 DATA34,244,127,201,205,43,126,42,240,127
10820 DATA233,205,51,0,201,59,0,84,65,80
10830 DATA69,49,54,32,45,67,79,80,89,82
10840 DATA73,71,72,84,32,49,57,56,50,45
10850 DATA32,68,65,86,69,32,84,82,65,80
10860 DATA65,83,83,79,13,0,76,111,97,100
10870 DATA13,84,101,115,116,13,86,101,114,105
10880 DATA102,121,13,87,114,105,116,101,13,69
10890 DATA100,105,116,13,74,117,109,112,13,62
10900 DATA0,82,69,65,68,89,32,67,65,83
10910 DATA83,13,0,61,32,0,73,78,80,85
10920 DATA84,32,0,83,84,65,82,84,32,65
10930 DATA68,68,82,69,83,83,61,0,69,78
10940 DATA68,32,65,68,68,82,69,83,83,61
10950 DATA0,88,45,70,69,82,32,65,68,68
10960 DATA82,69,83,83,61,0,54,32,67,72
10970 DATA65,82,65,67,84,69,82,32,78,65
10980 DATA77,69,61,0,67,72,69,67,75,83
10990 DATA85,77,32,69,82,82,79,82,32,0
11000 DATA79,86,69,82,76,65,89,0

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7. NO ROYALTIES imposed on registered ZBASIC owners.
8. Typical COMPILATION TIME is TWO SECONDS for a 4K program.
9. Use TRS-80 Basic to write ZBASIC programs!
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11. Fully compatible with both the Model I and the Model III. Mod I compiled programs work on a MODEL III, and vice-versa. ZBASIC works with NEWDOS-80, NEWDOS+, DOSPLUS, LDOS, MULTIDOS, ULTRADOS, TRSDOS etc. (Not TRSDOS Mod I double density)
12. BUILT-IN and much improved MUSIC and SOUND EFFECTS commands.
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15. ZBASIC 2.2 now has an INPUT @ command (similar to PRINT @).
16. The TAB function will now tab 255 columns on a printer. (BASIC cannot tab past column 64.)
17. NEWDOS 80 2.0 USERS can use the CMD "dos command" function! (DOSPLUS may use name "dos command")
18. NEW and EASIER to use USR COMMANDS.
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20. Logical STRING COMPARISONS are now supported.
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25. Invoke the compiler by simply hitting these two keys: "-"
26. NEW 60+ PAGE MANUAL WITH DESCRIPTIONS AND EXAMPLE.
27. ZBASIC 2.2 Comes with CMDFILE/CMD program from MISOSYS, to allow appending or merging compiled programs and machine language programs from tape or disk.

ZBASIC 2.2 DOES NOT SUPPORT THESE BASIC COMMANDS:

1. ATN, EXP, COS, SIN, LOG, TAN, and exponentiation. (However, subroutines are included in the manual for these functions.)
2. ERROR, ON ERROR GOTO, ERL, ERR RESUME.
3. No direct commands like AUTO, EDIT, LIST, LLIST ETC, although these commands may be used when writing programs.
4. Others NOT supported: CDBL, CINT, CSNG, DEFFN, FIX, FRE.
5. Normal CASSETTE I/O. (ZBASIC supports it's own SPECIAL CASSETTE I/O statements.)
6. SOME BASIC COMMANDS MAY DIFFER IN ZBASIC. For instance, END jumps to DOS READY, STOP jumps to BASIC READY etc.
7. MEMORY REQUIREMENTS: to approximate the largest BASIC program that can be compiled in your machine (at one time), enter BASIC and type: PRINT (MEM-6500)/2. Remember, you can merge compiled programs together to fill memory.

ZBASIC 2.2 SPEED COMPARISON DEMO

To help give you an idea how fast compiled programs are, we have included this demo program:

ZBASIC 2.2 DEMO PROGRAM

Time to compile and run complete program	: 0 MIN. 2 SEC.
BASIC Execution speed MOD 1, LEVEL II	: 7 MIN. 34 SEC.
ZBASIC Execution speed MOD 1, LEVEL II	: 0 MIN. 18 SEC.
BASIC Program size (WITHOUT VARIABLES)	: 895 BYTES
ZBASIC Program size (WITHOUT VARIABLES)	: 2733 BYTES

(Remember that the ZBASIC program includes an 1879 byte sub-routine package.) Program shown exactly as compiled and run in BASIC and ZBASIC.

```

10 '===== ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST=====
20 CLS: CLEAR 100: DEFINT A-X: DEFSTR Z: DIM AA(64,24), Z(50): RANDOM
30 AA=100: BB=-1000: CC=3: DD=-3: EE=-9999: ST$="START TIME "+TIME$
40 FOR I=1 TO 127 STEP 2: FOR J=47 TO 1 STEP -3: XX=POINT(I,J): SET(I,J)
50 XX=(I-J)/CC*(7+I+J): XX=ABS(INT(RND(I+J)-AA)+7): RESET(I,J)
60 XX=PEEK(I+J): POKE 15360+I+J, J: OUT 255, J AND (3*J): XX=INP(I)
70 AB$=STR$(I+J): BA$=LEFT$(AB$,2): AA(I/2,J/2)=VAL(BA$)+AA*3
80 BA$=BA$+RIGHT$(BA$,RND(3)): XX=INSTR(1,BA$, "9"): XX=SOR(I+J)
90 BA$=MID$(BA$,2,2): MID$(BA$,1,1)=Z: IF XX THEN 100 ELSE CLS
100 IF LEN(BA$)>3 OR SGN(XX)=1 AND ASC(BA$)=32 THEN PRINT "+++"
110 IF POS(0)>62 THEN TRON: TROFF: PRINT ELSE XX=NOT(RND(99))+100
120 AS$=INKEY$: IF AS$="Y" OR AS$="y" AND 1) 120 THEN PRINT "TRUE.."
130 RESTORE: READ A, C, Z(J), D: GOSUB 170: GOSUB 170: GOSUB 170: GOSUB 170
140 NEXT: PRINT "*";: NEXT I: CLS: PRINT 0512, ST$, "STOP TIME "+TIME$
150 STOP'===== END OF MAIN TEST LOOP =====
160 DATA 12345, -1, "TEST", -9999
170 ON RND(6) GOTO 180, 190, 200, 180, 190, 200
180 RETURN
190 RETURN
200 RETURN
210 ON RND(9) GOSUB 180, 190, 200, 180, 190, 200, 180, 190, 200
220 GOTO 140
  
```

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utility only takes about 1½ seconds to load under the System command at Model III high speed.

Tapetility's utilities use the hexadecimal (hex) number system to be more compatible with machine language. Don't panic if you don't know hex; you'll still be able to use the utilities.

Tapetility runs without modification on any Level II Model I/III with at least 16K of memory. I've provided three versions for different size memories. The program checks to see which machine you're using and takes the proper action.

Memory Requirements

All versions use 1K of memory. To create a system tape after you POKE it in from the Basic program, first read the section titled Operator Messages, then use the Write command by entering a W. Use the addresses listed in Table 1 when the program prompts you for them.

You can use any version of the utility that has the same or less memory as your computer. For example, TAPE16

and TAPE32 (Program Listings 1 and 2, respectively) run on a 32K machine; but TAPE32 or TAPE48 (Program Listings 2 and 3) won't run on a 16K machine. The program sets the memory stack area at 407D hex, the same area the ROM bootstrap routine uses.

Special Features

You can use the break key to return to Tapetility's main menu, even during cassette input/output. This is handy for correcting while using the utility, or for interrupting cassette operations. You can also load and execute a program from the utility, provided the program you're running doesn't use the break key.

Model I users should note that their ROM won't support the break key during cassette input. However, the utility looks for the break key after it reads each byte. This means you can use the break key during input, provided the asterisk is flashing. If the asterisk isn't flashing, rewind your tape slightly, and press the play button to get it flashing again. Cassette output (record) will

break at any time.

If you have a printer turned on while using the utility, all commands and addresses will be logged onto it. Since the program POKEs tape names and commands into video RAM, they don't appear on a printout when the program reads them off the tape.

Tapetility comes with the printer disabled, and you shouldn't enable the printer unless one is connected to your computer. If you do, the screen locks up while the computer waits for you to prepare the printer, and you'll have to reload the tape.

If you want to enable the printer function, use the Edit command to change the data at the addresses listed in Table 2. After making the changes, you can use the utility to make a new version of itself.

Command Descriptions

The Load command reads a tape and stores it in RAM, while Test will read a tape but not store the program in RAM.

The Verify command compares tape contents against memory content byte for byte for the addresses specified on the tape. This ensures that the tape code is exactly the same as that in memory. To generate a machine-language tape from the contents of a specified memory block, use the Write command.

The Edit command performs a variety of functions. You can use it to make changes in RAM contents, and for changing, examining, listing, or entering new programs.

The Jump command transfers control of the computer to the program you specified by the transfer address you stipulate. You can also use it to execute a program you load or to exit the utility by specifying a transfer address of 0000.

Operator Messages

All three commands—Load, Test, and Verify—identify the tape the program reads in the lower right-hand corner of your screen. These same three commands, used after the tape is read, print the following:

```
START ADDRESS=XXXX
END ADDRESS=XXXX
X-FER ADDRESS=XXXX
```

where XXXX is a four-digit number indicating the address at which the tape loads and runs in memory. You can then use these addresses to make a back-up tape using the Write command.

Checksum Error indicates a read error. Error XXXX differs from Checksum Error in that it is only generated

Version	Start Address	End Address	Transfer Address
Tape16	7C00 (31744)	7FEF (32751)	7C00 (31744)
Tape32	BC00 (48128)	BFEF (49135)	BC00 (48128)
Tape48	FC00 (64512)	FFEF (65519)	FC00 (64512)

Table 1. Hex load addresses: Decimal in (XXXXXX).

Program Listing 2. Tape32.

```
10 CLS
20 PRINT "TAPE32 MACHINE LANGUAGE POKE ROUTINE- BY DAVE TRAPASSO"
30 POKE 16561,255:POKE 16562,187:CLEAR 10
40 PRINT "MEMORY SIZE IS NOW SET TO PROTECT THE MACHINE LANGUAGE R
ROUTINE"
50 PRINT "PROGRAM LOADS AT HEX BC00-BFEF (48128-49135 DECIMAL)"
60 PRINT "CAUTION: MAKE SURE YOU SAVE THE BASIC PROGRAM BEFORE RUN
NING"
70 PRINT "WAIT ABOUT 15 SECONDS FOR THE POKE ROUTINE":S=0
80 FOR I= -17408 TO -16401
90 READ A:POKE I,A:S=S+A:NEXT I
95 PRINT "THE SUM OF YOUR DATA STATEMENTS IS: ";S;" , IT SHOULD BE
115931"
96 IF S<>115931 THEN STOP
100 REM- SET UP THE BREAK KEY VECTOR TO JUMP TO THE START OF THE P
ROGRAM
110 POKE 16396,195:POKE 16397,0:POKE 16398,188
120 INPUT "HIT THE BREAK KEY TO RUN";A$
130 PRINT "YOU HIT A KEY OTHER THAN BREAK":STOP
10000 DATA 49,125,64,205,248,1,205,201,1,33
10010 DATA 59,191,205,105,189,62,195,50,12,64
10020 DATA 33,0,188,34,13,64,33,3,66,54
10030 DATA 195,35,54,12,35,54,64,6,64,62
10040 DATA 95,205,53,191,16,249,33,98,191,205
10050 DATA 105,189,6,1,33,252,191,229,205,64
10060 DATA 0,225,126,254,87,202,122,189,254,74
10070 DATA 202,46,191,254,69,202,166,190,254,84
10080 DATA 40,8,254,86,40,4,254,76,32,203
10090 DATA 35,54,170,205,128,190,205,147,2,205
10100 DATA 53,2,254,85,32,249,33,249,63,17
10110 DATA 246,191,6,6,205,53,2,119,18,19
```

Listing 2 continued

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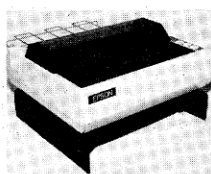
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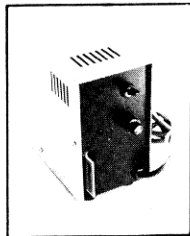
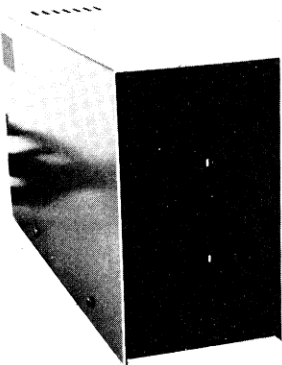
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10130 DATA205,53,2,71,205,20,3,34,244,191
10140 DATA24,21,205,157,190,205,53,2,254,120
10150 DATA40,116,254,60,32,242,205,53,2,71
10160 DATA205,20,3,77,124,129,79,205,148,190
10170 DATA205,53,2,95,58,252,191,254,84,40
10180 DATA39,254,86,40,62,213,229,235,33,0
10190 DATA188,237,82,56,4,225,209,24,17,63
10200 DATA235,43,17,255,191,237,82,48,242,62
10210 DATA0,50,253,191,24,235,56,2,123,119
10220 DATA123,129,79,35,16,197,205,53,2,185
10230 DATA40,166,205,248,1,33,216,191,205,105
10240 DATA189,205,118,189,195,37,188,126,187,40
10250 DATA225,34,244,191,205,248,1,33,225,191
10260 DATA17,245,191,205,115,189,24,229,43,34
10270 DATA242,191,205,20,3,34,240,191,205,248
10280 DATA1,33,155,191,17,245,191,205,115,189
10290 DATA33,170,191,17,243,191,205,115,189,33
10300 DATA183,191,17,241,191,205,115,189,58,253
10310 DATA191,254,170,40,185,33,232,191,205,105
10320 DATA189,24,174,213,205,105,189,225,205,80
10330 DATA189,43,205,80,189,201,126,15,15,15
10340 DATA15,205,89,189,126,230,15,198,48,254
10350 DATA58,56,2,198,7,195,53,191,33,148
10360 DATA191,126,254,0,200,205,53,191,35,24
10370 DATA246,205,67,189,62,13,24,233,205,102
10380 DATA189,33,198,191,205,105,189,6,6,33
10390 DATA246,191,229,229,126,8,205,64,0,225
10400 DATA126,254,13,32,4,8,119,24,9,205
10410 DATA35,190,205,27,190,205,43,190,205,128
10420 DATA190,205,132,2,62,85,205,100,2,6
10430 DATA6,225,126,205,100,2,35,16,249,42
10440 DATA242,191,237,91,244,191,237,82,35,36
10450 DATA205,157,190,37,40,12,62,60,205,100
10460 DATA2,62,0,205,1,190,24,238,175,189
10470 DATA40,9,62,60,205,100,2,125,205,1
10480 DATA190,62,120,205,100,2,33,240,191,126
10490 DATA205,100,2,35,126,205,100,2,205,248
10500 DATA1,195,37,188,205,100,2,245,205,148
10510 DATA190,241,201,205,248,189,71,123,205,248
10520 DATA189,122,205,248,189,131,79,26,205,248
10530 DATA189,129,79,19,16,247,121,24,221,33
10540 DATA170,191,17,243,191,24,14,33,155,191
10550 DATA17,245,191,24,6,33,183,191,17,241
10560 DATA191,213,229,205,102,189,225,205,105,189
10570 DATA33,252,191,229,6,4,205,64,0,225
10580 DATA209,205,76,190,205,93,190,56,208,129
10590 DATA190,56,41,205,116,190,205,93,190,56
10600 DATA33,129,18,27,201,126,35,254,71,48
10610 DATA15,254,48,216,254,58,56,5,254,65
10620 DATA216,198,9,230,15,55,63,201,7,7
10630 DATA7,7,79,201,225,225,43,43,43,233
10640 DATA58,147,2,238,205,40,3,205,66,48
10650 DATA243,33,133,191,205,105,189,195,73,0
10660 DATA58,64,56,230,4,194,12,64,201,58
10670 DATA62,60,238,10,50,62,60,201,205,35
10680 DATA190,205,118,189,205,4,191,205,236,190
10690 DATA33,252,191,229,6,2,205,64,0,225
10700 DATA126,254,10,40,49,254,91,40,30,254
10710 DATA13,40,21,5,40,14,205,93,190,56
10720 DATA216,205,116,190,205,93,190,56,208,129
10730 DATA42,244,191,119,205,38,191,24,201,42
10740 DATA244,191,43,34,244,191,24,192,33,145
10750 DATA191,195,105,189,205,4,191,205,43,0
10760 DATA254,0,32,173,205,38,191,205,118,189
10770 DATA24,238,33,245,191,205,72,189,205,236
10780 DATA190,42,244,191,229,126,254,32,56,4
10790 DATA254,128,56,2,62,46,205,53,191,205
10800 DATA236,190,225,195,80,189,42,244,191,35
10810 DATA34,244,191,201,205,43,190,42,240,191
10820 DATA233,205,51,0,201,59,0,84,65,80
10830 DATA69,51,50,32,45,67,79,80,89,82
10840 DATA73,71,72,84,32,49,57,56,50,45
10850 DATA32,68,65,86,69,32,84,82,65,80
10860 DATA65,83,83,79,13,0,76,111,97,100
10870 DATA13,84,101,115,116,13,86,101,114,105
10880 DATA102,121,13,87,114,105,116,101,13,69
10890 DATA100,105,116,13,74,117,109,112,13,62
10900 DATA0,82,69,65,68,89,32,67,65,83
10910 DATA83,13,0,61,32,0,73,78,80,85
10920 DATA84,32,0,83,84,65,82,84,32,65
10930 DATA68,68,82,69,83,83,61,0,69,78
10940 DATA68,32,65,68,68,82,69,83,83,61
10950 DATA0,88,45,70,69,82,32,65,68,68
10960 DATA82,69,83,83,61,0,54,32,67,72
10970 DATA65,82,65,67,84,69,82,62,78,65
10980 DATA77,69,61,0,67,72,69,67,75,83
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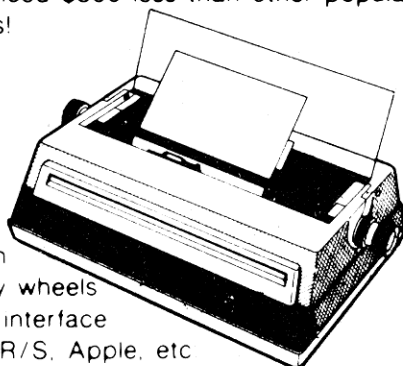


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from the Verify command. Here, XXXX represents the hex address where the mis-compare was found. The program then returns to the main menu.

A return to the menu with no error message and a listing of addresses as stated above means the tape code is identical to that in memory.

When the READY CASS prompt appears, prepare your recorder to play or record a tape and hit any key to start.

Tapetility only generates an overlay error message from the Load command

and means that the program just loaded requires an area of memory occupied by the utility. This normally wipes out the utility since you'd be altering its instructions. Tapetility checks for this condition and loads all memory locations specified by the addresses on the tape except those used by the utility. When this occurs, the overlay message appears after the computer finishes reading the tape. The Test command won't generate the message, and the Verify command gives you an Error XXXX message. Use a different version of the utility to solve the problem.

Version	Address	Enable Printer	Disable Printer
Tape16	7F38	C3	C9
Tape32	BF38	C3	C9
Tape48	FF38	C3	C9

Table 2. Data addresses for printer function.

The CASS? prompt is the same as the Model III Basic prompt, and Tapetility requests it before every cassette input or output command. The utility determines which machine you're using and bypasses the prompt on the Model I. Respond by typing an L for low speed or an H for high speed. By reading a tape at low speed and recording at high speed, you can change the speed of your existing tapes for a faster load.

The first prompt for the Write command, Input 6 Character Name =, represents the name you want recorded. Always use a six-character name. For example, if the name of your program is Yours, hit the space bar once after typing the five letters. If you press the enter key before entering any name, the utility uses the name and address read from the previous tape, and bypasses all the following input address prompts:

INPUT START ADDRESS =
INPUT END ADDRESS =
INPUT X-FER ADDRESS =

Calling All Machine-Language Programs

by David J. Trapasso

Until now, calling machine-language programs from a Basic program was difficult. You either had to load the machine-language program, protect the memory size, then load the Basic program every time you wanted to use it, or convert the binary code of the machine-language program into decimal numbers so they could be POKEd into memory from Basic.

The second method was easier since it involved loading only one tape, but both methods were prone to mistakes.

I decided to write a utility in machine language to solve this problem (see Program Listing 4). This program runs on Level II Models I and III, with at least 16K of memory. It takes the data in any block of memory entered by the user and generates a tape of data statements that Basic can read.

Once you load the Basic data tape, you can write a short POKE routine in the body of the program to read the data, and POKE the machine code back in.

The utility makes a Basic data tape starting with line 10000. Each line holds 10 pieces of data, and lines are numbered in increments of 10. You

can see in Listing 4 that I used the utility on its own machine code to make a Basic program out of itself.

The utility loads at about 4K from the top of the first 16K block of memory. This is useful for those with only 16K of memory available. Any machine-language program larger than 4K won't leave enough room in a Basic program for the data statements needed to represent the machine-language program.

Once you make the data tape, the utility doesn't have to be resident in memory with the Basic program.

Notice line 30 in Listing 4. It shows one way to reserve memory without having to set the memory size every time you run the program.

When you run the Basic listing, it takes a few seconds to POKE in the machine code. After you POKE the program in, it prompts you to execute it by pressing the break key. You could also use the USR function in your program to execute it.

To use the utility, protect the memory so the machine-language program you want to copy is protected. If your code resides below the utility (7000 hex), you'll have to change line 30 of Listing 4 to protect it. You can then load the utility in the

form of the Basic listing and run it.

When you run the utility, it prompts you for the starting address in hex. Enter the four-digit address, using leading zeroes is necessary. If you make a mistake, use the left arrow to correct it or the break key to reenter the entire number.

The utility then prompts you for the end address. After entering it, the READY CASSETTE prompt appears. Set your tape recorder to record and press any key. When the recorder stops, the utility will start again. It's best to make more than one copy to increase the chances that at least one copy will be good.

Make sure you load the data tape in Basic before writing the body of your program. If you don't, you'll have to find some way to merge the two sections of your program. Model III users should make sure they set the cassette speed before they run the utility to know the correct speed at which to run the data.

A good way to practice using the utility is to make a data tape of your first ROM locations. Load the generated tape in Basic, then PEEK the same locations. It's all easier than you think! ■

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The program then prompts for these addresses with the Write command. Enter the addresses for the block of memory you want to copy to tape and the address where program execution begins. If you're making a copy of another tape, simply hit the enter key when prompted to enter the six-character name. If you're creating a tape, such as a copy of this utility after you POKE it in from Basic, you have to enter the name and all the addresses.

To change only the tape name, type in the new name and, when prompted for the addresses, enter the addresses shown on the display after the Load or Verify command.

You must enter all addresses as four digits, and you need to include leading zeroes. Note that the program requests the transfer address during the Jump command and the start address during the Edit command.

To enter a command, enter its first letter. For example, enter a V to use the Verify command or an L to use the Load command. The > symbol that appears after the program displays the menu is the request for command entry. Terminate all user entries by hitting the enter key.

Editing

In the Edit mode, the program first prompts you for the start address of the area of RAM you want to edit. After you enter the four-character number,

the utility displays the following: XXXX = A = BB = CC, where XXXX is the address at which you're currently editing and A is the ASCII representation of the data in that address. The program displays nonprintable data as a period. (Tapetility displays only ASCII characters in the range of hex 20 to 7F hex.)

BB is the actual data in the hex address, and CC is your input, up to two characters long. You have one of the following six options:

- Pressing only the enter key bumps you up to the next RAM address and displays it without changing the contents of the prior address.

- Typing one character then hitting the enter key enters the ASCII character for the key pushed into memory location. You have to enter control ASCII characters such as enter (0D hex) as hex data. The program automatically displays the next location of memory after the enter key is pushed.

- Typing two characters then pressing the enter key changes the contents of the location to the hex number typed in. Again, the program automatically displays the next address. If you type a non-hex character, however, the contents of the location won't change, and Tapetility will print out the same address again. Make sure you look at the address as you edit to see if it increases by one to the next location. If you don't, you could start putting your en-

Program Listing 3. Tape48.

```
10 CLS
20 PRINT "TAPE48 MACHINE LANGUAGE POKE ROUTINE- BY DAVE TRAPASSO"
30 POKE 16561,255: POKE 16562,251 :CLEAR10
40 PRINT "MEM SIZE IS NOW SET TO PROTECT THE MACHINE LANGUAGE ROUTINE"
50 PRINT "PROGRAM LOADS AT HEX FC00-FFEF (64512-65519 DECIMAL)"
60 PRINT "CAUTION: MAKE SURE YOU SAVE THE BASIC PROGRAM BEFORE RUNNING"
70 PRINT "WAIT ABOUT 15 SECONDS FOR THE POKE ROUTINE":S=0
80 FOR I=-1024 TO -17
90 READ A: POKE I,A:S=S+A: NEXT I
95 PRINT "THE SUM OF YOUR DATA STATEMENTS IS: ";S;"", IT SHOULD BE 123170"
96 IF S<>123170 THEN STOP
100 REM- SET UP THE BREAK KEY VECTOR TO JUMP TO THE START OF THE PROGRAM
110 POKE 16396,195: POKE 16397,0 :POKE 16398,252
120 INPUT "HIT THE BREAK KEY TO RUN";A$
130 PRINT "YOU HIT A KEY OTHER THAN BREAK": STOP
10000 DATA49,125,64,205,248,1,205,201,1,33
10010 DATA59,255,205,105,253,62,195,50,12,64
10020 DATA33,0,252,34,13,64,33,3,66,54
10030 DATA195,35,54,12,35,54,64,6,64,62
10040 DATA95,205,53,255,16,249,33,98,255,205
10050 DATA105,253,6,1,33,252,255,229,205,64
10060 DATA0,225,126,254,87,202,122,253,254,74
10070 DATA202,46,255,254,69,202,166,254,254,84
10080 DATA40,8,254,86,40,4,254,76,32,203
10090 DATA35,54,170,205,128,254,205,147,2,205
10100 DATA53,2,254,85,32,249,33,249,63,17
10110 DATA246,255,6,6,205,53,2,119,18,19
```

Listing 3 continued

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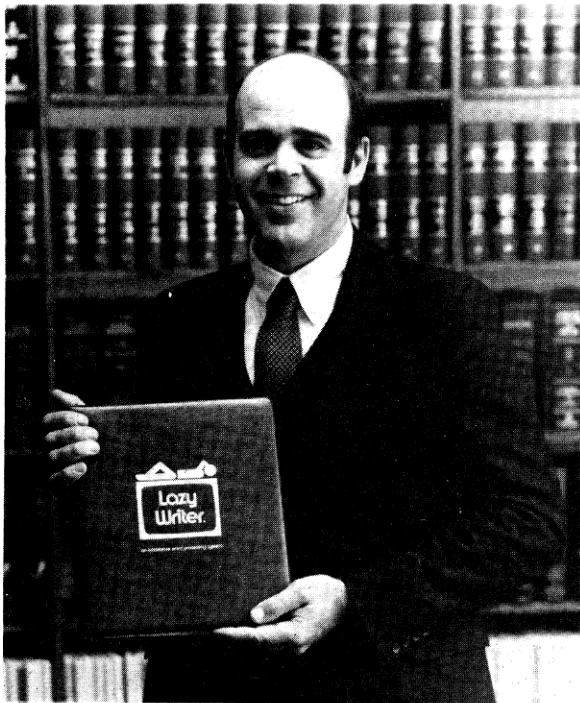
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Listing 3 continued

10120 DATA35,16,247,205,53,2,254,60,32,249
10130 DATA205,53,2,71,205,20,3,34,244,255
10140 DATA24,21,205,157,254,205,53,2,254,120
10150 DATA40,116,254,60,32,242,205,53,2,71
10160 DATA205,20,3,77,124,129,79,205,148,254
10170 DATA205,53,2,95,58,252,255,254,84,40
10180 DATA39,254,86,40,62,213,229,235,33,0
10190 DATA252,237,82,56,4,225,209,24,17,63
10200 DATA235,43,17,255,255,237,82,48,242,62
10210 DATA0,50,253,255,24,235,56,2,123,119
10220 DATA123,129,79,35,16,197,205,53,2,185
10230 DATA40,166,205,248,1,33,216,255,205,105
10240 DATA253,205,118,253,195,37,252,126,187,40
10250 DATA225,34,244,255,205,248,1,33,225,255
10260 DATA17,245,255,205,115,253,24,229,43,34
10270 DATA242,255,205,20,3,34,240,255,205,248
10280 DATA1,33,155,255,17,245,255,205,115,253
10290 DATA33,170,255,17,243,255,205,115,253,33
10300 DATA183,255,17,241,255,205,115,253,58,253
10310 DATA255,254,170,40,185,33,232,255,205,105
10320 DATA253,24,174,213,205,105,253,225,205,80
10330 DATA253,43,205,80,253,201,126,15,15,15
10340 DATA15,205,89,253,126,230,15,198,48,254
10350 DATA58,56,2,198,7,195,53,255,33,148
10360 DATA255,126,254,0,200,205,53,255,35,24
10370 DATA246,205,67,253,62,13,24,233,205,102
10380 DATA253,33,198,255,205,105,253,6,6,33
10390 DATA246,255,229,229,126,8,205,64,0,225
10400 DATA126,254,13,32,4,8,119,24,9,205
10410 DATA35,254,205,27,254,205,43,254,205,128
10420 DATA254,205,132,2,62,85,205,100,2,6
10430 DATA6,225,126,205,100,2,35,16,249,42
10440 DATA242,255,237,91,244,255,237,82,35,36
10450 DATA205,157,254,37,40,12,62,60,205,100
10460 DATA2,62,0,205,1,254,24,238,175,189
10470 DATA40,9,62,60,205,100,2,125,205,1
10480 DATA254,62,120,205,100,2,33,240,255,126
10490 DATA205,100,2,35,126,205,100,2,205,248
10500 DATA1,195,37,252,205,100,2,245,205,148
10510 DATA254,241,201,205,248,253,71,123,205,248
10520 DATA253,122,205,248,253,131,79,26,205,248
10530 DATA253,129,79,19,16,247,121,24,221,33
10540 DATA170,255,17,243,255,24,14,33,155,255
10550 DATA17,245,255,24,6,33,183,255,17,241
10560 DATA255,213,229,205,102,253,225,205,105,253
10570 DATA33,252,255,229,6,4,205,64,0,225
10580 DATA209,205,76,254,205,76,254,201,205,93
10590 DATA254,56,41,205,116,254,205,93,254,56
10600 DATA33,129,18,27,201,126,35,254,71,48
10610 DATA15,254,48,216,254,58,56,5,254,65
10620 DATA216,198,9,230,15,55,63,201,7,7
10630 DATA7,7,79,201,225,225,43,43,233
10640 DATA58,147,2,238,205,40,3,205,66,48
10650 DATA243,33,133,255,205,105,253,195,73,0
10660 DATA58,64,56,230,4,194,12,64,201,58
10670 DATA62,60,238,10,50,62,60,201,205,35
10680 DATA254,205,118,253,205,4,255,205,236,254
10690 DATA33,252,255,229,6,2,205,64,0,225
10700 DATA126,254,10,40,49,254,91,40,30,254
10710 DATA13,40,21,5,40,14,205,93,254,56
10720 DATA216,205,116,254,205,93,254,56,208,129
10730 DATA42,244,255,119,205,38,255,24,201,42
10740 DATA244,255,43,34,244,255,24,192,33,145
10750 DATA255,195,105,253,205,4,255,205,43,0
10760 DATA254,0,32,173,205,38,255,205,118,253
10770 DATA24,238,33,245,255,205,72,253,205,236
10780 DATA254,42,244,255,229,126,254,32,56,4
10790 DATA254,128,56,2,62,46,205,53,255,205
10800 DATA236,254,225,195,80,253,42,244,255,35
10810 DATA34,244,255,201,205,43,254,42,240,255
10820 DATA233,205,51,0,201,59,0,84,65,80
10830 DATA69,52,56,32,45,67,79,80,89,82
10840 DATA73,71,72,84,32,49,57,56,50,45
10850 DATA32,68,65,86,69,32,84,82,65,80
10860 DATA65,83,83,79,13,0,76,111,97,100
10870 DATA13,84,101,115,116,13,86,101,114,105
10880 DATA102,121,13,87,114,105,116,101,13,69
10890 DATA100,105,116,13,74,117,109,112,13,62
10900 DATA0,82,69,65,68,89,32,67,65,83
10910 DATA83,13,0,61,32,0,73,78,80,85
10920 DATA84,32,0,83,84,65,82,84,32,65
10930 DATA68,68,82,69,83,83,61,0,69,78
10940 DATA68,32,65,68,68,82,69,83,83,61
10950 DATA0,88,45,70,69,82,32,65,68,68
10960 DATA82,69,83,83,61,0,54,32,67,72
10970 DATA65,82,65,67,84,69,82,32,78,65
10980 DATA77,69,61,0,67,72,69,67,75,83
10990 DATA85,77,32,69,82,82,79,82,32,0
11000 DATA79,86,69,82,76,65,89,0

tries in out of sequence at this point.

- Pressing the down-arrow key then hitting the enter key lists and displays the addresses continuously until you hit any other key. You can continue editing at the point which you stop the listing without having to reenter the address. If you have a printer turned on, you can get a printout of the program.

- Pressing the up-arrow key, then the enter key, takes you to the next lowest RAM address. This doesn't change memory contents.

- Pressing the break key takes you out of the Edit mode and returns you to the menu. After making changes, or entering a program of your own, you can use Tapetility to make a permanent copy.

Making a Back-up Copy

First, load the original copy of the

tape and check for the overlay message. Use a different version of Tapetility if an overlay error occurs and try again.

Then verify the original tape. While not mandatory, it is highly recommended to ensure that the original code is identical to that in memory. If you get an Error XXXX message, load and verify the original tape again.

You can now invoke the Write command to record the program on tape. At this point the back-up tape is complete, but you should verify the back-up to ensure you made a good copy.

You can also use the utilities to make back-up copies of themselves. After creating a machine-language tape of the utility, see the Memory Requirements section on creating a tape after you POKE it in from Basic and Table 1. Read the tape as you would any back

up, then hit the enter key when prompted for the name.

DOS users should be aware that Tapetility will run directly from disk without alteration if transferred to disk using the Tape command. You can use this utility to find the start, end, and transfer addresses of CMD files by transferring the files to tape, then using the utility to load the tape.

Problems

The most common problem with Tapetility is that the tape won't stop. If you're returned to the menu, the problem is a sticky relay. Turning the recorder off solves this problem; if you're not returned to the menu and the asterisks flash, you aren't done yet.

If you are reading a tape and the asterisks aren't flashing, check your volume and/or tone control. Another possibility is that you're reading the tape at the wrong speed.

If you checked this and the asterisks stop flashing but the tape doesn't stop, you might have a bad tape. Apparently, the utility searched for the transfer address at the end of the file and never found it. Try loading the tape under the System command. If it doesn't load there, the utility won't load it. To avoid this problem, hit the break key to return to the menu.

Checksum errors are also a common problem. They can be caused by dirty, magnetized, or misaligned tape heads, incorrect tone or volume setting, a bad copy of the tape, or an incorrect speed setting.

If the tape won't stop after recording, check the asterisk; if it's still flashing, make sure you didn't type in addresses that would send a huge block of memory to tape. This could take a long time, especially at low speed. Use the break key to return to the menu. If you are returned to the menu, the relay is stuck again.

If you suspect a problem with your ROM, use Tapetility to make a tape of the ROM. Use the Verify command to check it with a tape from another CPU.

If you type an incorrect character, use the left-arrow key to correct it. If you already entered the information, use the break key, but you will have to reenter the information again.

If you type a non-hex character, such as the letter O instead of a zero, the utility prompts you for the same information again. ■

David J. Trapasso can be reached at 29 Boulevard Parkway, Rochester, NY 14612.

```
10 CLS
20 PRINT" MACHINE LANGUAGE TO DATA TAPE ROUTINE- BY DAVE TRAPASSO"
30 A=28671:POKE16561,A-INT(A/256)*256:POKE16562,INT(A/256):CLEAR 1
40 PRINT"MEMORY SIZE IS NOW SET TO PROTECT THE MACHINE LANGUAGE PR
OGRAM":PRINT"PROGRAM LOADS AT HEX 7000-7189 (28672 TO 29065 DECIMA
L)"
50 FOR I=28672 TO 29065
60 READ A:POKE I,A:NEXT I
70 REM- SET UP THE BREAK KEY VECTOR TO JUMP TO THE START OF THE PR
OGRAM
80 POKE 16396,195:POKE16397,0:POKE16398,112
90 INPUT "HIT THE BREAK KEY TO RUN":AS
100 PRINT "YOU HIT A KEY OTHER THAN THE BREAK KEY"
110 STOP
10000 DATA49,125,64,205,248,1,205,201,1,33
10010 DATA26,113,205,182,112,33,98,113,17,139
10020 DATA113,205,223,112,56,245,33,119,113,17
10030 DATA141,113,205,223,112,56,245,33,69,113
10040 DATA205,182,112,205,73,0,243,205,132,2
10050 DATA6,3,62,211,205,100,2,16,249,62
10060 DATA68,205,100,2,42,140,113,237,91,138
10070 DATA113,237,82,35,34,146,113,33,16,39
10080 DATA6,10,62,5,205,100,2,62,68,205
10090 DATA100,2,125,205,100,2,124,205,100,2
10100 DATA62,136,205,100,2,35,26,19,205,197
10110 DATA112,245,124,254,48,40,6,124,205,100
10120 DATA2,24,3,189,40,4,125,205,100,2
10130 DATA241,205,100,2,221,33,146,113,221,53
10140 DATA0,32,6,221,53,1,250,170,112,217
10150 DATA120,254,1,40,5,62,44,205,100,2
10160 DATA16,199,62,0,205,100,2,195,80,112
10170 DATA6,7,62,0,205,100,2,16,249,195
10180 DATA0,112,126,254,0,200,205,51,0,35
10190 DATA24,246,62,13,195,51,0,217,14,100
10200 DATA22,10,6,48,145,4,48,252,5,129
10210 DATA96,6,48,146,4,48,252,5,130,104
10220 DATA198,48,201,213,205,182,112,33,142,113
10230 DATA229,6,4,205,64,0,225,209,205,242
10240 DATA112,216,205,3,113,216,7,7,7,7
10250 DATA79,205,3,113,216,129,18,27,201,126
10260 DATA35,254,71,48,15,254,48,216,254,58
10270 DATA56,5,254,65,216,198,9,230,15,55
10280 DATA63,201,66,65,83,73,67,32,68,65
10290 DATA84,65,32,84,65,80,69,32,66,85
10300 DATA73,76,68,69,82,45,32,66,89,32
10310 DATA68,65,86,69,32,84,82,65,80,65
10320 DATA83,83,79,13,0,82,69,65,68,89
10330 DATA32,67,65,83,83,69,84,84,69,44
10340 DATA32,72,73,84,32,65,78,89,32,75
10350 DATA69,89,13,0,73,78,80,85,84,32
10360 DATA83,84,65,82,84,32,65,68,68,82
10370 DATA69,83,83,61,0,73,78,80,85,84
10380 DATA32,69,78,68,32,65,68,68,82,69
10390 DATA83,83,61,0
```

Program Listing 4. Machine Language to Data Tape.

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Assembly Language Made Simple—Part II

by Hardin Brothers

Assembly language frightens a lot of people. I've seen writers apologize for using it in microcomputing magazines. But after last month's dose of programming ("Assembly Language Made Simple—Part I," p. 74), I hope you're becoming comfortable with Assembly language.

This month, I'll introduce some new opcodes and programming techniques, as well as an easy method of adding machine-language routines to your Basic programs.

Getting Started

The first program draws a border around the screen (see Program Listing 1). It starts by equating the label Video to 3C00H, the hexadecimal (hex) address of the first screen location (line 170). Next, the EQU pseudo-op in line

The lesson continues. Increase your Assembly-language vocabulary while learning to produce sounds and create borders for your screen.

180 defines the character that creates the border. I use CHR\$(191), a full graphics block, for this demonstration, but you can easily change it to some other character by changing the EQU instruction.

Line 200 establishes the ORG of the program at 7000 hex, just as in last month's programs. The program starts on line 220.

The HL register pair points to (holds

the address of) the current screen print position. Line 220 loads HL with the value VIDEO - 1. Note that the assembler can perform simple arithmetic. Most assemblers support addition (+) and subtraction (-), as well as logical AND (&) and shift (<).

Operands for assembler arithmetic include direct numbers and label values. Line 220 asks the assembler to look up the value for Video, subtract 1 from that value, and write the machine code to load the result into the HL register pair.

Line 220 points HL to the first memory location below the screen in order to allow a loop that first increments HL and then prints information on the screen. It may seem more natural to reverse the order of events—print, then increment—but by incrementing HL first, HL always points to the current, instead of the next, print position at the end of the instruction loop. This makes the logic that prints the sides of the screen simpler.

Line 230 loads the B register with

```

00100 ;*****
00110 ;*
00120 ;*   Screen Border Program   *
00130 ;*
00140 ;*****
00150 ;
00160 ;
00170 VIDEO EQU 3C00H ;TOP OF SCREEN
00180 CHAR EQU 191D ;FULL GRAPHICS BLOCK
00190 ;
00200 ORG 7000H
00210 ;
00220 LD HL,VIDEO-1 ;HL=>TOP OF SCREEN
00230 LD B,65 ;TOP POSITIONS + 1
00240 TOP INC HL ;POINT TO NEXT SPACE
00250 LD (HL),CHAR ;FILL SPACE
00260 DJNZ TOP ;REPEAT FOR TOP LINE
00270 ;
00280 LD B,14 ;B = # OF LINES
00290 LD DE,63 ;SPACES IN EACH LINE
00300 MIDDLE ADD HL,DE ;SKIP MIDDLE OF SCREEN
00310 LD (HL),CHAR ;FILL A SPACE
00320 INC HL ;POINT TO NEXT SPACE
00330 LD (HL),CHAR ;FILL ANOTHER SPACE
00340 DJNZ MIDDLE ;LOOP UNTIL SIDES DONE
00350 ;
00360 LD B,63 ;SPACES LEFT AT BOTTOM
00370 BOTTOM INC HL ;POINT TO NEXT SPACE
00380 LD (HL),CHAR ;FILL SPACE
00390 DJNZ BOTTOM ;FILL BOTTOM ROW
00400 ;
00410 LOOP JR LOOP ;ENDLESS LOOP TO END
00420 ;
00430 END 7000H ;INCLUDE STARTING ADDR.

```

Program Listing 1. Creates a screen border.

The Key Box
Models I and III
16K RAM
Assembly Language
Editor/Assembler

65—the number of print positions across the top of the screen plus the first position in the second row. The B register acts as a counter for the program's first loop, which starts in line 240, with the label Top. First, the program increments HL to point to the next position, then line 250 loads the value of CHAR to that position.

Line 260 demonstrates the first new opcode for this month: DJNZ. Written in full, this instruction is "Decrement B then perform a relative Jump if B is not zero." This is a common and powerful opcode, but you must understand several important implications to use it correctly.

You can use DJNZ only if the B register is set up as a loop counter. There is no equivalent instruction for any other register or register pair. The B register is 8 bits wide. It can hold any value from zero to 255 (binary values from 00000000 to 11111111). When the Z80 chip finds a DJNZ instruction, it first decrements the B register; if the value in B is zero before the decrement, it is 255 afterwards. Therefore, DJNZ can operate a loop one to 256 times.

Relative Jumps

After a DJNZ instruction decrements B the program tests the result to see if it's zero. If so, the loop ends and control passes to the next instruction in memory. If not, the program performs a relative jump (usually backwards) to run a loop.

In last month's programs, all jumps are to an immediate, specific address. A relative jump operates differently. Instead of including a specific address, a relative jump includes a 1-byte offset from the current address. If the offset byte is less than 128 decimal (80 hex), the computer adds the value to the current address in the PC (program counter) register and jumps forward in memory. If the offset byte is 128 decimal or greater, the program subtracts the complement of the offset from the PC register and the value jumps backwards.

In other words, the offset can be between -128 and +127. However, because the PC updates to point to the next instruction before the program performs the current instruction, the effective offset is -126 to +129.

The last few paragraphs are difficult; make sure you understand them, then examine line 260 in Listing 1. Because B was set to 65 decimal before the loop began, the loop from lines 240 to 260 repeats 65 times. When the loop is completed, it fills all of the top video row

and the first position of the second video row. HL still points to the first position in the second row.

The video screen shows 16 rows of 64 characters each. Our program fills the top row and bottom row completely, but only the outside edges of the middle 14 rows. Therefore, in each of the middle 14 rows, we want to print the first and sixty-fourth positions. In line 280, B is set to 14 again as a loop counter. DE is set to 63, the offset from the first to last print position in each row.

The loop for printing the middle of the screen begins on line 300 with the label Middle, and here you meet the second new opcode for this month, ADD. The Z80 chip supports an 8-bit and 16-bit addition instruction. If it adds two 8-bit values, it places one of the values in the A register and, after the addition, the result is set in the A register. If adding two 16-bit values, it places one in the HL register, which holds the result after the addition.

Line 300 adds the present value in the DE register, 63 decimal, to the current value in the HL register. The HL register contains the sum after the addition. The HL register then points to the last print position in the current row after the addition. Starting in line 310, the print character appears at the end of the row, HL increments to point to the

first position of the next row, placing the print character there, and the loop repeats. By the end of the middle loop, the entire top row, the entire left side, and all of the right side except the last row are printed.

The last section of the program, starting in line 360, is similar to the first. It loads the B register with 63 decimal, the number of print positions remaining in the last row (remember that the first position in that row is already printed). Then HL increments and the print character appears 63 times. Finally, in line 410, an endless loop keeps the program from wandering off unattended, and in line 430, the End pseudo-op signals both the program's end and its starting address.

Possible Problems

Assemble Listing 1 (keep the source code) and run it. You should see a white border around your screen. One warning is necessary: If you try to run the program while your computer is in the 32-character mode, the result is unpredictable. On a Model I, the top, bottom, and left sides of the screen print, but not the right side. This is because the 32-character mode only displays characters in even-numbered print positions. With a Model III, the results are even less clear.

```

00100 ;*****
00110 ;*
00120 ;*   Screen Border Program   *
00130 ;*   modified to be run      *
00140 ;*   as a Basic subroutine  *
00150 ;*
00160 ;*****
00170 ;
00180 ;
00190 VIDEO EQU 3C00H ;Top of Screen
00200 ;
00210 ORG 7FE1H ;PUTS THE PROGRAM AT
00220 ; THE TOP OF 16K MEMORY
00230 ; USE 0BFELH FOR 32K
00240 ; USE 0FFELH FOR 48K
00250 ; (see text)
00260 ;
00270 CALL 0A7FH ;GET PARAMETER IN HL
00280 LD A,L ;A HOLDS PRINT CHAR.
00290 ;
00300 LD HL,VIDEO-1 ;HL==TOP OF SCREEN-1
00310 LD B,65D ;B=# OF TOP POSN.S + 1
00320 TOP INC HL ;POINT TO NEXT SPACE
00330 LD (HL),A ;PRINT CHARACTER
00340 DJNZ TOP ;REPEAT FOR TOP LINE
00350 ;
00360 LD B,14D ;B=# OF ROWS - 2
00370 LD DE,63D ;DE= SPACES TO SKIP
00380 MIDDLE ADD HL,DE ;SKIP MIDDLE OF SCREEN
00390 LD (HL),A ;PRINT AT END OF ROW
00400 INC HL ;HL==> BEG. OF NEXT ROW
00410 LD (HL),A ;PRINT AT BEG. OF ROW
00420 DJNZ MIDDLE ;LOOP UNTIL SIDES DONE
00430 ;
00440 LD B,63D ;SPACES LEFT AT BOTTOM
00450 BOTTOM INC HL ;POINT TO NEXT SPACE
00460 LD (HL),A ;PRINT CHARACTER
00470 DJNZ BOTTOM ;FILL BOTTOM ROW
00480 ;
00490 RET ;RETURN TO BASIC
00500 ;
00510 END ;NO START VALUE NEEDED.
00520 ;

```

Program Listing 2. Screen border as Basic subroutine.

The Model III contains a hardware defect that makes the 32-character mode occasionally malfunction. Any time a program accesses the screen directly in 32-character mode, the results are unpredictable because of a timing problem within the computer.

To avoid the problem, you must include an NOP (no operation) instruction immediately after all instructions that load to or from the screen. NOP forces the computer to do nothing for a short period of time. By putting this short delay into your programs, you can work around the Model III peculiarities. (The Model III timing fault doesn't seem to exist on the Model 4 running in either Model III or Model 4 mode.)

The border around the screen looks nice, but you're probably thinking that the endless loop at the end of the program makes it useless. Yet you can use the program as a subroutine for a Basic program by changing it only slightly. You might want to have the Basic program print something on the screen, and then have the machine-language routine draw the frame to create, for instance, a title screen for a program.

Program Listing 2 is the same as Listing 1 except that the program is now in a form that Basic can use. There are only a few changes. First, change the origin (ORG) value to place the routine as high as possible in 16K memory. If you have more memory available, use one of the alternate ORGs given in the program's comments.

Second, the program starts with a call to 0A7F hex. When Basic invokes a machine-language routine (I explain that process below), it can pass a single value or parameter to the machine-language program. If your machine-language program is expecting a value, it must start with CALL 0A7FH, which places

that value in the HL register pair. Listing 2 allows Basic to specify which print character to use. Line 280 of Listing 2 transfers the least-significant byte (LSB) of the parameter from register L to register A.

Ignore the most-significant byte (MSB) here because a display value can be only 1 byte long. If Basic mistakenly sends a value larger than 255, the program uses only the LSB, and reports no error message.

From line 300 to line 470, Listing 2 is the same as Listing 1 except that the value in the A register prints on the screen instead of the value of the label CHAR. However, line 490 has a re-

“You can use the program as a subroutine for a Basic program by changing it only slightly.”

turn (RET) instruction that needs explanation.

Learning Returns

Basic treats machine-language programs as subroutines. All subroutines must end with some form of a return to pass control back to the original program. Therefore, whenever you write a machine-language program to use with Basic, you should include a RET command at the end of the program. To send a single parameter back to Basic, load the parameter into the HL register pair and return to Basic with the instruction JP 0A9AH. If there is no RET command at the end of Listing 2, Basic can't resume control of your computer.

After you enter and assemble Listing

2 (or modify Listing 1 to look like Listing 2), you need to link it into a Basic program. There are several techniques for doing this. I'll concentrate on the most direct one for now.

Save the source code first, then assemble the program to tape or disk. If you use a disk system, you may want to give the program's filespec an extension other than /CMD since this program won't run from the DOS READY prompt. The most commonly used extension for routines of this type is /CIM (core image file), which indicates that you should load the program into memory but you can't run it directly.

When you're ready to use the program, load it into memory without running it. If the assembled program is on tape, use the System command to load the program, but hit the break key at the following SYSTEM prompt to return to Basic. If the assembled program is on disk, use the Load command from DOS READY before entering Basic.

In either case, you also have to set memory size to protect the program. To calculate the correct answer to the Memory Size? prompt, subtract one from the ORG value in the machine-language program and convert the answer to decimal. You may want to record that value in your program notes.

Your next job is to tell the computer where the program resides in memory, so that Basic can call it with a USR command. If you use Disk Basic, your program must contain the command

DEFUSR = &Hnnnn

where nnnn is the hexadecimal address of the first machine instruction you want to execute.

Setting the address for tape Basic is more complicated, and is best illustrated with a concrete example. Your goal is to store the address of the routine

Tape Systems:

System Memory	Program 2 ORG	Memory Size Prompt
16K	7FE1H	32736
32K	0BFE1H	49120
48K	0FFE1H	65504

Disk Systems:

System Memory	Program 2 ORG	Memory Size Prompt
16K	7FE1H	32736
32K	0BFE1H	49120
48K	0FFE1H	65504

Line 100, Listing 3

POKE 16526	POKE 16527
225	127
225	191
225	225

Line 100, Listing 3

DEFUSR =
&H7FE1
&HBFE1
&HFFE1

Table 1. Set-up values for Listings 2 and 3.

```

10 *****
20 *
30 * Marquee Demonstration *
40 * Program *
50 *
60 *****
70 '
80 '
90 CLS
100 DEFUSR = &H7F74 'See Table 2
110 PRINT @ 281,"Press Any Key";
120 PRINT @ 410,"To Continue";
130 A = USR(0)
140 CLS
150 PRINT CHR$(23);
160 PRINT @ 274,"THANK YOU!"
170 PRINT : PRINT : PRINT : PRINT
180 END

```

Program Listing 3. Makes a running border.

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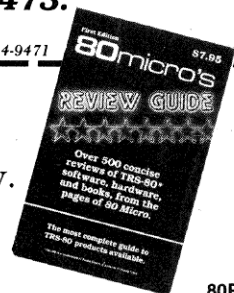
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in memory locations 16526 and 16527. Assuming you assembled the program to load starting at 7FE1 hex, take the second byte (last two digits) of that address, 0E1 hex, and translate that value into decimal 225. (There is a handy table at the back of your computer manual where you can look up the values.) Your program needs to POKE that value into memory location 16526. Then take the first byte, 7F hex, translate it into decimal 127, and POKE that value into 16527.

Now include a statement in your Basic program similar to

A = USR(X)

X contains the value sent to the machine-language program. After control passes back to Basic, A contains the value passed back from your machine-language program.

Program Listing 3 is a short Basic program that demonstrates how a Basic program can use the Listing 2 version of the border routine. Table 1 helps you find the correct memory size and POKE

values to use with your particular system.

I've introduced many new details this month: The rest of the article will be easier. Be sure you have a good grasp on the concepts to this point. Experiment with Listings 1 and 2 to see how you might modify them. For example, you might try printing the border around

"A pattern looks as if it's moving if it is continually offset and reprinted on the screen."

only the top part of the screen, or add a second border inside the first.

A Marquee Border

Program Listing 4 contains this

month's second program, which sets up a running marquee border around the screen, keeps it moving until you press any key, and then returns control to the Basic program that calls it.

The underlying concept of this program is that a pattern looks as if it's moving if it is continually offset and reprinted on the screen. The program defines three patterns in lines 1010-1140. A graphics block and two spaces compose each, but the order changes in each. Printing the first pattern around the edge of the screen, then the second, then the third, and repeating this process indefinitely, creates the illusion of a moving series of blocks.

Lines 100-250 should be familiar and need no further explanation. The main loop of the program is in lines 260-380, with a routine known as a driver. Subroutines perform all of the real work in this program—the driver is responsible for calling the subroutines in the correct order with a pointer set correctly. The use of such a driver provides structure and clarity to a program, and simplifies debugging.

```

00100 ;*****
00110 ;*
00120 ;*   Marquee Border Program
00130 ;*   (to be called from Basic)
00140 ;*
00150 ;*****
00160 ;
00170 ;
00180 VIDEO EQU 3C00H ;TOP OF SCREEN
00190 ;
00200 ;
00210 ORG 7F74H ;PUTS PROGRAM AT TOP
00220 ;OF 16K MEMORY
00230 ;USE 0BF74H FOR 32K MEMORY
00240 ;USE 0FF74H FOR 48K MEMORY
00250 ;
00260 START LD IX,PATRN1 ;IX==>1ST PATTERN
00270 CALL FRAME ;PRINT IT
00280 CALL DELAY ;DELAY A WHILE
00290 CALL GETKEY ;LOOK FOR KEYSTROKE
00300 LD IX,PATRN2 ;IX==>2ND PATTERN
00310 CALL FRAME ;PRINT IT
00320 CALL DELAY ;WAIT A WHILE
00330 CALL GETKEY ;CHECK KEYSTROKE AGAIN
00340 LD IX,PATRN3 ;IX==>3RD PATTERN
00350 CALL FRAME ;PRINT IT
00360 CALL DELAY ;WAIT A WHILE
00370 CALL GETKEY ;CHECK KEYBOARD AGAIN
00380 JR START ;LOOP BACK FOREVER
00390 ;
00400 GETKEY EQU $ ;CHECK KEYBOARD --
00410 ;RETURN TO PROGRAM IF NO KEY
00420 ;ELSE CLEAR STACK AND RETURN
00430 ;TO BASIC
00440 LD A,(3BFFH) ;CHECK IF ANY KEY
00450 OR A ;SET FLAGS
00460 RET Z ;IF NONE, RETURN
00470 POP HL ;ELSE CLEAR STACK
00480 RET ;AND RETURN TO BASIC
00490 ;
00500 FRAME LD HL,VIDEO-1 ;HL==>SCREEN TOP - 1
00510 LD B,64D ;B = SPACES TO FILL
00520 TOP INC HL ;HL==> NEXT POSITION
00530 LD A,(IX) ;GET CHARACTER
00540 LD (HL),A ;PRINT IT
00550 CALL INCPTR ;INCREMENT PATTERN
00560 DJNZ TOP ;REPEAT FOR TOP LINE
00570 ;
00580 LD DE,64D ;SPACE BETWEEN LINES
00590 LD B,15D ;LINES TO PRINT
00600 RIGHT ADI HL,DE ;MOVE DOWN ONE LINE
00610 LD A,(IX) ;GET CHARACTER
00620 LD (HL),A ;PRINT IT
00630 CALL INCPTR ;INCREMENT PATTERN
00640 DJNZ RIGHT ;FILL RIGHT SIDE
00650 ;
00660 LD B,63D ;SPACES LEFT ON BOTTOM
00670 BOTTOM DEC HL ;MOVE LEFT ONE SPACE
00680 LD A,(IX) ;GET CHARACTER
00690 LD (HL),A ;PRINT IT
00700 CALL INCPTR ;INCREMENT PATTERN
00710 DJNZ BOTTOM ;FILL BOTTOM ROW
00720 ;
00730 ; Note -- DE is still equal to 64D
00740 ;
00750 LD B,14D ;LINES UP SIDE
00760 LEFT XOR A ;RESET CARRY FLAG
00770 SBC HL,DE ;MOVE UP ONE LINE
00780 LD A,(IX) ;GET CHARACTER
00790 LD (HL),A ;PRINT IT
00800 CALL INCPTR ;INCREMENT PATTERN
00810 DJNZ LEFT ;FILL LEFT SIDE
00820 ;
00830 RET ;END OF ROUTINE
00840 ;
00850 INCPTR INC IX ;POINT TO NEXT CHAR.
00860 LD A,(IX) ;GET CHARACTER
00870 OR A ;SET STATUS FLAGS
00880 RFT NZ ;RETURN IF NOT ZERO
00890 DEC IX ;ELSE POINT BACK TO
00900 DEC IX ;BEG. OF PATTERN BY
00910 DEC IX ;DEC. 3 TIMES
00920 RET ;RETURN TO CALLER
00930 ;
00940 DELAY LD BC,1800H ;DELAY VALUE
00950 DI0 DEC BC ;BC = BC-1
00960 LD A,B ;GET MSB OF VALUE
00970 OR C ;MERGE WITH LSB
00980 JR NZ,D10 ;GO BACK UNTIL BC=0
00990 RFT ;THEN RETURN
01000 ;
01010 PATRN1 DEFB 191D ;1ST PATTERN IS BLOCK
01020 DEFB 32D ; FOLLOWED BY TWO
01030 DEFB 32D ; SPACES
01040 DEFB 0 ;MARK END OF PATTERN
01050 ;
01060 PATRN2 DEFB 32D ;2ND PATTERN IS SPACE
01070 DEFB 191D ; BLOCK AND
01080 DEFB 32D ; SPACE
01090 DEFB 0 ;MARK END OF PATTERN
01100 ;
01110 PATRN3 DEFB 32D ;3RD PATTERN IS TWO
01120 DEFB 32D ; SPACES AND THEN
01130 DEFB 191D ; A BLOCK
01140 DEFB 0 ;MARK END OF PATTERN
01150 ;
01160 END ;END OF PROGRAM

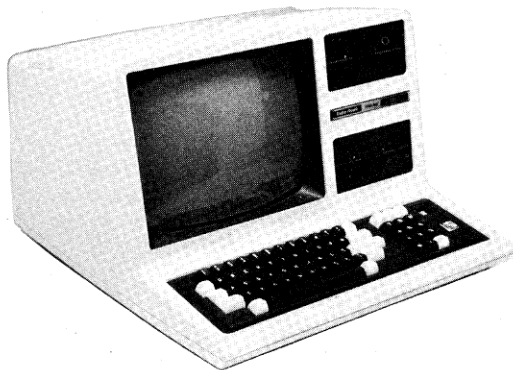
```

Program Listing 4. Running border called from Basic.

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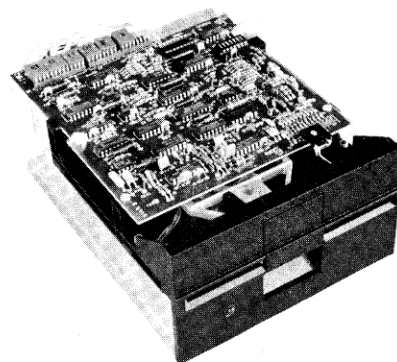
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In this program, the IX register points to the current print character, the HL register pair points to the current print position, DE holds line offset

```

10 *****
20 *
30 * Border Demonstration *
40 * Program *
50 *
60 *****
70
80
90 CLS
100 DEFUSR = &H7FE1 'See Table 1
110 PRINT @ 280,"Border Character";
120 FOR I = 0 TO 255
130 PRINT @ 350,I;
140 A = USR(I)
145 FOR J = 1 TO 150 : NEXT J
150 NEXT I
151 PRINT @ 350," ";
160 PRINT @ 350,"32";
170 A = USR(32)
180 END

```

Program Listing 5. Border demonstration.

values, B counts loops, BC holds delay values, and the A register transfers values from the print patterns to the screen.

Starting with line 260, IX points to the first print pattern. The Frame routine then prints that pattern around the screen. The program calls the short Delay routine, and calls GETKEY to check for a keystroke. The computer returns control to Basic if you press a key. The program repeats the same sequence of commands twice, with IX pointing to a new pattern each time.

You see a new opcode in line 380. JR performs a relative (as opposed to an absolute) jump to another part of a program. Like DJNZ, JR can only jump a short distance forward or backward. It requires 1 less byte of memory than JP,

and it allows relocatable, or position-independent, programs, but JR operates slightly slower than an absolute jump.

The first subroutine shown is GETKEY. It is similar to the Key routine in last month's third program. Line 400 shows a new pseudo-op, \$, which means "at this location." The \$ can indicate the value of a label, and the value of relative jumps (for example, JR \$-4 means jump back 4 bytes).

In lines 440 and 450, GETKEY first checks to see if you pressed a key. If you haven't, the Z flag is set and the conditional return, RET Z, sends control back to the driver loop. If you have pressed a key, the program returns to Basic.

A simple return instruction doesn't work because it only returns to the driver loop. Whenever the program executes a call, the Z80 saves the address of the next regular instruction onto the stack before transferring control to the subroutine. The stack is simply a first-in first-out data structure contained somewhere in memory (Basic sets it immediately below the cleared string space).

The classic analogy that describes a stack is a cafeteria plate-holder. Pushing a value (always a 2-byte value) onto the stack is like placing another plate on the pile. POPing a value off the stack is similar to removing the top plate. The SP register keeps track of the current address of the top value on the stack automatically.

Each call instruction pushes the return address on the stack and jumps to the subroutine. If you press a key, GETKEY ignores the first return address—the one leading to the driver—and instead returns to the second address, leading back to Basic. Therefore, the first value is POPed off the stack into the HL register. A RET command then transfers control back to the original Basic program.

The second subroutine, Frame, begins on line 500. It is similar to Listing 1, except it fills the two sides of the screen separately. It first loads each print value into the A register with an LD A,(IX) command, then transfers the values to the screen with LD (HL),A. After each character prints, the program calls INCPTR (line 850) to increment and test the IX pointer. If IX reaches the end-of-pattern marker (a zero byte), IX decrements three times to point back to the beginning of the pattern.

The last section of Frame is the Left routine, where you meet another new opcode, SBC (subtract with carry). The

```

00100 *****
00110 *
00120 * Machine-Language Sound *
00130 * Receives values for *
00140 * Tone and Duration from *
00150 * calling Basic program *
00160 *
00170 *****
00180
00190 ; Connect an amplifier to the cassette Aux plug
00200 ; before running this program.
00210
00220 PORT EQU 0FFH ;Cassette Port
00230
00240 ORG 7FE8H ;FOR TOP OF 16K MEMORY
00241 ;USE 0BF8H FOR 32K MEMORY
00242 ;USE 0FF8H FOR 48K MEMORY
00250 CALL 0A7FH ;GET VALUE FROM BASIC
00260 ;L WILL HAVE TONE VALUE
00270 ;H WILL HAVE DURATION
00280 DI ;DISABLE INTERRUPTS
00290 LD C,H ;PUT DURATION IN C
00300 LOOP1 LD B,L ;GET FREQ. VALUE
00310 LD A,1 ;OUTPUT VALUE
00320 OUT (PORT),A ;SEND IT OUT
00330 LOOP2 DJNZ LOOP2 ;DELAY FOR 1/2 CYCLE
00340 LD B,L ;GET FREQ. VALUE AGAIN
00350 LD A,2 ;OUTPUT VALUE
00360 OUT (PORT),A ;SEND IT OUT
00370 LOOP3 DJNZ LOOP3 ;DELAY FOR 1/2 CYCLE
00380 DEC C ;DEC. DURATION COUNT
00390 JR NZ,LOOP1 ;REPEAT UNTIL C=0
00400 EI ;ENABLE INTERRUPTS
00410 RET ;THEN RETURN TO BASIC
00420
00430 END ;END OF PROGRAM

```

Program Listing 6. Sound tone and duration values.

Tape Systems:

System Memory	Program 4 ORG	Memory Size Prompt	Line 100, Listing 5 POKE 16526	Line 100, Listing 5 POKE 16527
16K	7F74H	32627	116	127
32K	0BF74H	49011	116	191
48K	0FF74H	65395	116	255

Disk Systems:

System Memory	Program 4 ORG	Memory Size Prompt	Line 100, Listing 5 DEFUSR =
16K	7F74H	32627	&H7F74
32K	0BF74H	49011	&HBF74
48K	0FF74H	65395	&HFF74

Table 2. Set-up values for Listings 4 and 5.

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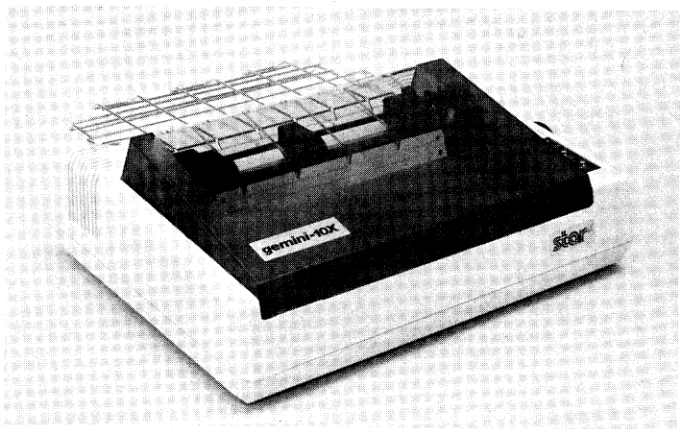
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**Tape
Systems:**

System Memory	Program 6 ORG	Memory Size Prompt	Line 100, Listing 7	
			POKE 16526	POKE 16527
16K	7FE8H	32743	232	127
32K	0BFE8H	49127	232	191
48K	0FFE8H	65511	232	255

**Disk
Systems:**

System Memory	Program 6 ORG	Memory Size Prompt	Line 100, Listing 7 DEFUSR =
16K	7FE8H	32743	&H7FE8
32K	0BFE8H	49127	&HBFE8
48K	0FFE8H	65511	&HFFE8

Table 3. Set-up values for Listings 6 and 7.

Z80 instruction set doesn't include a straight 16-bit Subtract command, so use SBC here. SBC HL,DE subtracts the value in DE from HL, loads the result in HL, and decrements HL by one if the program sets the carry flag. To be sure that line 770 produces the correct result, you must be sure the program hasn't set the carry flag.

The Z80 has two commands that directly affect the carry flag: SCF (set car-

ry flag) and CCF (complement carry flag, which changes it to the opposite of its current status). You can use the two together to reset the carry flag so it doesn't alter the results of the subtraction. However, XOR A does the same thing faster. An exclusive OR (XOR) of the A register always sets the A register to zero, sets the zero flag, and resets the carry flag. This instruction is often a shorthand method of establishing

known values for the A register and both flags.

DELAY, the last subroutine of the program, begins in line 940. It slows down program execution to produce an attractive display. The Z80 operates so quickly that without a delay routine, you lose the marquee effect. Try removing lines 280, 320, and 360 to see how fast the program can operate.

Line 940 loads the BC register pair with a delay value of 1800 hex. If you want to change the delay time, change that value. Then, in a loop from line 950 to line 980, BC decrements one step at a time until it equals zero, when the program returns control to the driver.

The mechanics of checking BC for zero should be familiar from last month. By using the timing codes in your editor/assembler manual you can calculate how long each instruction takes. The Delay subroutine, as written, takes about .08 seconds on a Model III and slightly longer on a Model I.

Since I wrote Listing 4 for use with a Basic program, you have to follow the same procedure you use with Listing 2. The correct values for memory size and setting the USR addresses are in Table 2, and Listing 5 is a short program that

- **DISPLAYS CORRECT SPELLINGS:** If you don't know the correct spelling, EW will look it up for you, and display the dictionary.

- **VERIFIES CORRECTIONS:** If you think you know the correct spelling of a word, EW will check it for you before making the corrections.

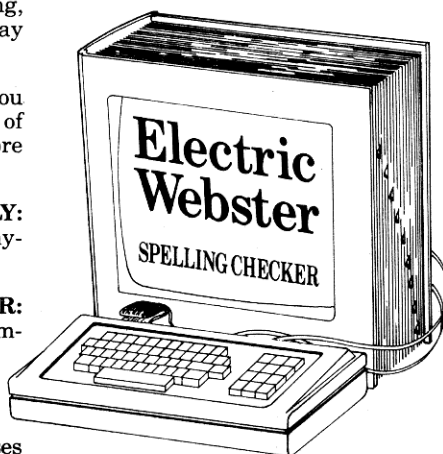
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```

10 '*****
20 '*
30 '*      Sound Demonstration
40 '*      Program
50 '*
60 '*****
70 '
80 '
90 CLS
100 DEFUSR = &H7FE8      'See Table 3
110 PRINT @ 17, "Connect Amplifier to AUX Plug"
120 PRINT @ 151, "Then Press <ENTER>"
130 IF INKEY$ <> CHR$(13) THEN 130
140 CLS
150 FOR I = 1 TO 8
160   READ A,B
170   K = A + B*256
180   IF K>32767 THEN K=K-65536
190   T = USR(K)
200 NEXT I
210 END
220 '
230 DATA 255,114
240 DATA 192,227
250 DATA 192,76
260 DATA 192,151
270 DATA 152,191
280 DATA 171,255
290 DATA 192,76
300 DATA 171,170

```

Program Listing 7. Sound demonstration.

demonstrates the marquee effect.

Making Noise

The last Assembly-language program this month (Program Listing 6) is a short Sound routine that, like many games, produces tones when you connect the cassette AUX plug to a small amplifier. There are complex Sound routines that allow greater variations in duration, timbre, and pitch. However, this routine is one of the simplest and serves to demonstrate how the TRS-80 produces sound.

Line 220 sets the label Port equal to OFF hex. (To use the Model 4's internal sound speaker, change this to 90 hex.) On Models I and III, you can use port OFF hex as a cassette interface.

The computer normally writes data on cassette by toggling bits zero and 1 of the cassette port, producing both a high and low output. Sending a value of 1 to the port produces the top half of a square wave; sending a value of 2 produces the bottom half. Sending a 1 then a 2 produces a single square wave tone. The length of time it takes to create the wave determines the pitch, with longer times producing lower notes. The number of wave cycles determines the duration of a note.

Line 250 loads the HL register pair with a value sent from Basic. The L register contains the note's pitch, the H register its duration. Since the program stores tone and duration information separately in Basic, you must combine them before sending them to the sound program. Listing 7 is a short Basic demonstration program showing how you might perform the combination.

Line 280 contains the command DI

(Disable Interrupts). If you have a 16K Model I without an expansion interface, ignore this instruction. Otherwise, you must include it to avoid generating a gravel-like sound. Any computer capable of a constantly updated clock display interrupts the program presently running several times a second to update the clock counters. The DI instruction keeps those interrupts from occurring, but causes the clock to lose time.

Line 290 loads the duration count (the number of times to repeat the tone's wave) into the C register. Then, in line 300, the program loads the frequency value into the B register. The program loads register A with a 1, which the program sends to the cassette port with the OUT (PORT),A command in line 320. Then a short DJNZ loop, LOOP2, decrements the B register to zero.

So far, the program has sent half of the wave to the port. Line 340 again loads B from the H register, loads A with 2, sends the new value to the port, and uses another DJNZ loop to form the second half of the wave.

Line 380 decrements the C register once. If its value is not yet zero, it performs a relative jump to LOOP1, and forms a new wave to send to the port. When C reaches zero, it re-enables the interrupts with the EI command in line 400, and control returns to Basic. Although you can make the Sound routine more complex, it is adequate for use in games and for alerting an operator.

Table 3 shows the correct set-up values for the Sound routine depending on your computer type and memory size. Program Listing 6 demonstrates how to read tone values from a data table and

send them to the machine-language routine. Each data line contains two values for the tone's pitch and duration. Notice that the larger a pitch value, the lower the note sounds. Because the machine-language program decrements both B and C before it tests them, a zero (equal to 256) represents the lowest pitch and the longest duration. However, to make the data values easier to manipulate, the program uses only values between 1 and 255.

To calculate relative pitches of notes, you need to know that two notes a half-step apart form a ratio of 1.05946. If you use 255 for the lowest note, the pitch one-fourth higher is $255 / (1.05946)^3$. Round any fractions to the closest integer. If you don't feel like calculating exact note values, experiment until you find acceptable tones.

Note lengths are a function of the pitch value times the duration value. You can reproduce a piece of music by using a duration of 255 for the longest, highest note, and scaling other duration values from there.

Learning More

So far, I have shown you: how to use approximately 20 opcodes and pseudo-ops, the general structure of Assembly language, and one way to add machine-language routines to Basic programs. Most programmers use Assembly language for one of three purposes: to add machine-language routines to Basic, to write stand-alone game programs, or to write utility and application programs.

It is beyond the scope of this series to explore utilities and applications, which are almost always long and complicated. So next month I'll show you some of the structures and programming considerations required to write a stand-alone game, as well as how to use more of the Z80's instruction set. If you want more help writing subroutines for your Basic programs, try reading my column *The Next Step* in back issues of *80 Micro*. A major purpose of that column is to explore ways of mixing machine language and Basic.

If you subscribe to CompuServe and want to discuss any part of this series, leave me a message on the SASIG message board. Type GO PCS-117 to arrive at SASIG; my PPN is 72165,735. Feel free to join in on discussions other readers start. ■

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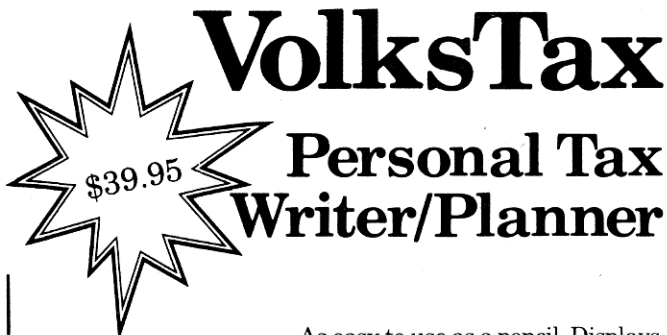


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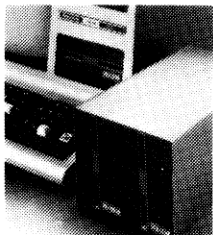
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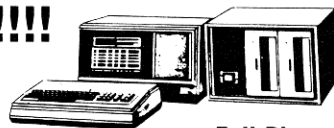
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Synthetically Speaking— Part I

by David L. Engelhardt

This board gives your Model I/III speech capability. Use it in applications for education and the handicapped. It's a real chatterbox.

Talk isn't cheap, but it's getting cheaper. Once an expensive undertaking, adding speech capability to your 16K Model I or III is now affordable and fairly easy to accomplish.

In this two-part series, I'll show you how to build and use a speech board for your Model I/III. In this part, I cover the theory, construction, and testing of

the board's hardware circuits. Next month I'll go into applications for the handicapped and in education, with programs that convert keystrokes and ASCII string text into synthesized speech.

Although I built this system on a Model III, it also works on a Model I since both computers use the same in-

put/output communications signals (see Table 1). The only difference between the set-up of the two units is that the Model III uses a 50-pin connector and the Model I uses a 40-pin connector.

Parts to Buy

I based the entire speech circuit on the Votrax SC-01 speech synthesizer chip, which costs about \$50. I bought the chip from Micromint Inc. (the addresses of all the manufacturers cited appear at the end of this article).

Since I have an S-100 expansion bus, I built the speech circuit on an S-100 plug-in card. The Photo shows the complete circuit, consisting of the decoding circuit, 8255 controller, SC-01 speech chip, and the amplifier that operates an external 8 ohm speaker. Notice that there's still room left on the S-100 card for future additions to the speech circuit.

The Vector Electronic Co. manufactures the S-100 plug-in card (part number 8802-1). I like to use these cards because the two-connections-per-trace design allows easy point-to-point wiring. The cards plug into an S-100 motherboard manufactured by Wameco Inc. (part

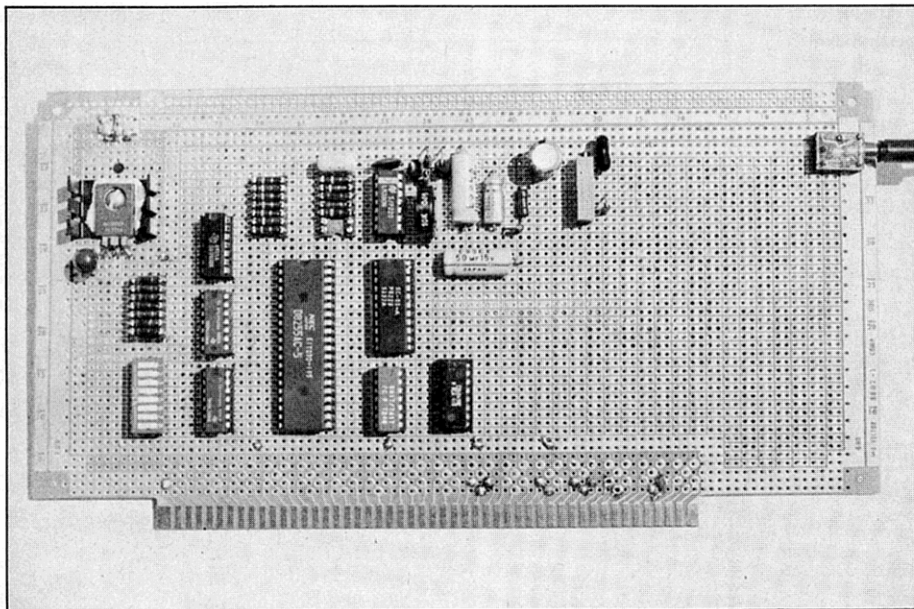
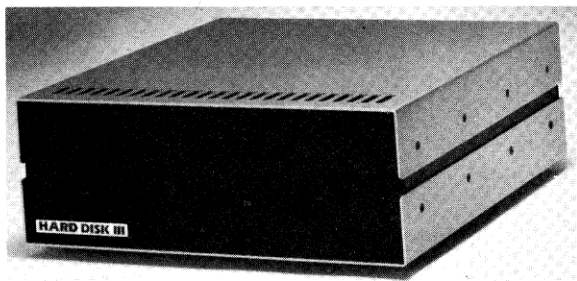


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The motherboard allows expansion to 12 extra cards, not including the speech board. As it stands, I have the computer interface/clock board in one slot, the port control board in another, and the speech board in a third slot. I still have plenty of room for future expansion. You must provide a 5- and 12-volt power supply to operate the speech board.

If you use a different plug-in card design, chances are it will be smaller. You can still build the speech board using smaller cards, but you may have to split up the total circuit. Using smaller cards shouldn't present any problems as you can easily link them together with ribbon cables. Adapt the required computer signals to your bus configuration according to the circuit schematics.

Port Decoding Circuit

The port decoding section shown in Fig. 1 consists of U1, U2, and two gates of U3. U1 and U2 are two-input, exclusive OR gates that make up the main port decoding section. Switches S1-S6 consist of an 8-DIP-switch (dual in-line processor) package that plugs into a 16-pin integrated circuit (IC) socket with two switches left for future use. Use these switches to set or change the speech ports to the configuration you need, but keep them within the zero to 7F hexadecimal (hex) port limits set by Radio Shack.

I use four ports to operate the speech board via an 8255 programmable peripheral interface chip that controls the Votrax chip. For simplicity, Fig. 1 shows the port decoding signals that consist of everything to the left of the 8255 chip (U4). Figure 2 details the signals that control the SC-01 chip.

I use the 8255 chip as the interface between the Model I/III and the SC-01, due to the SC-01's internal set-up requirements. I'll cover this when I describe the SC-01 synthesizer chip below.

Address lines A2-A7 in Fig. 1 tie to U1 and U2 to decode the base port value. Address lines A0 and A1 tie directly to the 8255 to decode its four internal ports. U1 and U2 turn on and stay selected for a decoding range of four, while address lines A0 and A1 actually perform the internal selection of the four ports within the 8255 chip.

Since I selected ports 16-19 decimal to control the Votrax chip, U1 and U2 set up the base, or bottom, port number (16 decimal) and stay selected while the combination of A0 and A1 make up the actual four ports (16-19) that control the 8255 chip.

U1 makes up the most significant half of the SC-01's base port number. Only one-half of U2 makes up the least significant half of the SC-01's port. The unused gates are available for future use. Select the port number by setting switches S1-S6 to either high (open) or ground. The switches you set to ground actually make up the port's decoded number.

When you don't select the port, the logic state on pin 1 of U3A is normally low. This is because the exclusive OR gate always outputs a logic low whenever either two lows or two highs are on the gate's inputs. Thus, when a decoding switch is open, one of the inputs goes to a high state. If an address line on the other input is high at the same time, it yields a logical low on the output gate

that turns off the decoder.

The decoder section requires only one gate with a low output from U1 or U2 to turn off. Since a logical high is one-half the requirement on pin 1 of U3A to turn on the decoder, all decoding exclusive OR gates must have a logical high output. The exclusive OR gate supplies a logical high output only when both of the inputs on each gate are of opposite states.

For example, I decoded the speech board for ports 10-13 hex (16-19 decimal). Since the most significant port digit is 1 hex, I set switch S4 to ground and leave switches S1-S3 open. Since the least significant hex digit is a zero, switches S5 and S6 are also open. The switches tied to ground apply a logic low to one-half of a gate's inputs while

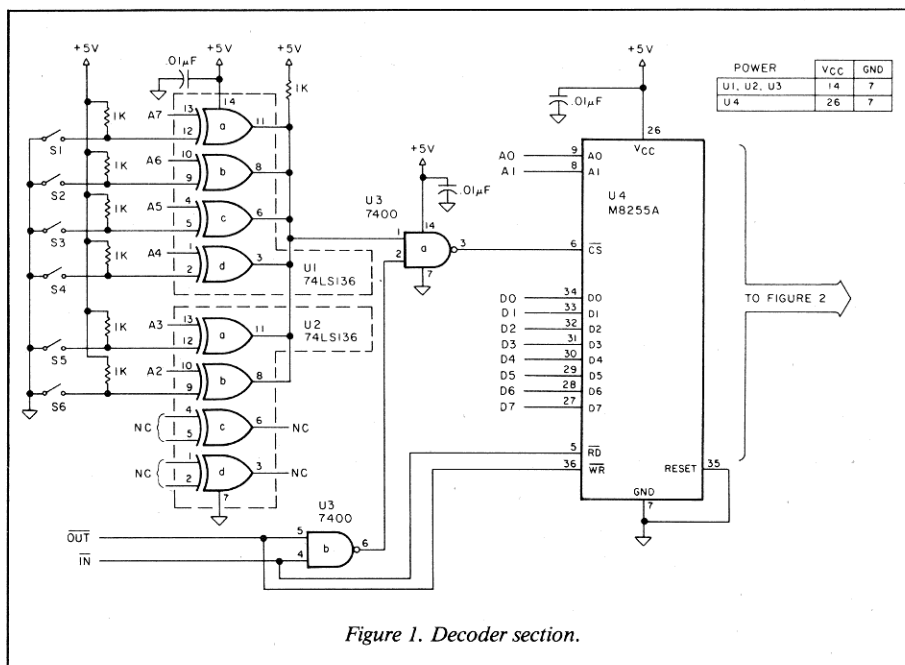


Figure 1. Decoder section.

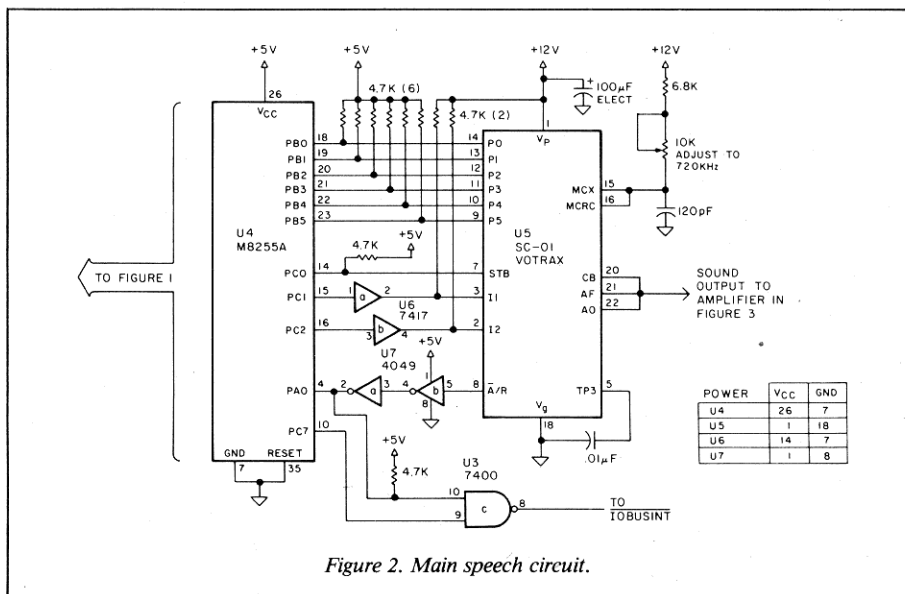


Figure 2. Main speech circuit.



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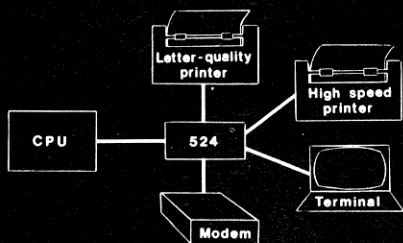
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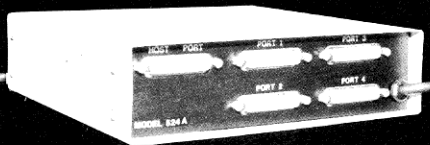
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the open switches apply logical highs.

At the selection of port 10 hex, address lines A5-A7 are logical low giving opposite states on the inputs to the gates. This results in logical highs on their outputs. Address line A4 is high, and since its corresponding switch is low, the inputs are of opposite states and result in a logical high as an output.

The least significant digit using address lines A2 and A3 works the same way as the most significant digit. Since address lines A2-A7 decode the base port (10 hex), the decoder enables no matter what state address lines A0 and

A1 are in. While address lines A2-A7 stay selected to enable the 8255, the combination of address lines A0 and A1 changes to select the four internal ports required to operate the 8255.

Any time the Input or Output command selects a port, the computer generates a corresponding in or out signal. The computer applies these two signals to the gates of U3B and its output goes high in the presence of either one of the in or out signals. The computer applies the logical high output of U3B combined with the decoded port signal to the inputs of U3A to give a logical low

Model I pin designations

Signals	Computer Pin Designations
D0	Pin 30
D1	Pin 22
D2	Pin 32
D3	Pin 26
D4	Pin 18
D5	Pin 28
D6	Pin 24
D7	Pin 20
A0	Pin 25
A1	Pin 27
A2	Pin 40
A3	Pin 34
A4	Pin 31
A5	Pin 35
A6	Pin 38
A7	Pin 36
In*	Pin 19
Out*	Pin 12
IOBUSINT*	Pin 21

(* = negative true)

Model III pin designations

Signals	Computer Pin Designations (J2)
D0	Pin 1
D1	Pin 3
D2	Pin 5
D3	Pin 7
D4	Pin 9
D5	Pin 11
D6	Pin 13
D7	Pin 15
A0	Pin 17
A1	Pin 19
A2	Pin 21
A3	Pin 23
A4	Pin 25
A5	Pin 27
A6	Pin 29
A7	Pin 31
In*	Pin 33
Out*	Pin 35
IOBUSINT*	Pin 39

All Even

Ground >-----< 2 TO 50

Table 1. Model I and Model III pin designations.

output.

The output of U3A enables the 8255 chip for the Read and Write commands needed to control the SC-01 speech chip. The computer also ties the in and out signals directly to the 8255 to control the direction of data flow in conjunction with the actual Input or Output command. The computer ties the in signal to the RD input and the out signal to the WR input of the 8255. The computer connects all data lines to the 8255 for reading from and writing to the SC-01 synthesizer chip.

You may wonder why U3 is a standard TTL (transistor to transistor logic)

*“Through part-swapping
and troubleshooting
I discovered
that the system runs
without trouble
with a 7400 chip.”*

chip instead of an LS (low power Schottky) chip like the others. I discovered through part-swapping and troubleshooting that a 74LS00 doesn't have enough drive capability to enable the 8255. The system either locks up or gets lost when I used a 74LS00, but runs without trouble with a 7400 chip. Please keep this in mind when you buy the parts for the speech circuit.

The 8255 Controller

The programmable peripheral interface, or 8255 (U4) for short, allows configuration to any system or device with little difficulty. You can set it up to

run in three different modes. I opted to run the 8255 in mode zero for the speech board application.

There are 16 possible configurations within mode zero and Table 2 shows these different configurations. Configuration 8 applies to the speech board application. (Get Intel's *Component Data Catalog* for more information on the 8255 interface chip. This book describes in detail the many combinations and configurations available with this chip in all three modes of operation.)

Writing a control word to the 8255 sets mode zero, making two 8-bit ports and two 4-bit ports available. Ports A and B are the 8-bit ports and port C is split in half to create the two 4-bit ports. All outputs are latching outputs and all inputs are non-latching inputs.

For the speech application, decoded port 19 decimal writes the control and configuration word (144 decimal) to the 8255 chip. Decoded port 18 sets up communications with the 8255's internal port C. Decoded port 17 sets up port B and port 16 communicates with the 8255's port A.

Figure 2 shows the ports that control the SC-01 speech chip. Port B, with its latching outputs, sends a code to the SC-01 and stores it there while port C tells the SC-01 to latch port B's contents. Port C also controls the SC-01's inflection inputs. Port A samples an output from the SC-01 to indicate that it's ready for a new phoneme code. I'll discuss phonemes in more detail below.

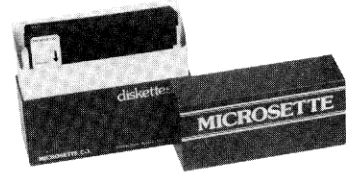
The SC-01 Speech Synthesizer

The SC-01 is a self-contained chip capable of phonetically synthesizing continuous speech by combining phonemes. This chip can reproduce the 64

Num	Value	Port A	Port B	Port C/Upper	Port C/Lower
0	128	output	output	output	output
1	129	output	output	output	input
2	130	output	input	output	output
3	131	output	input	output	input
4	136	output	output	input	output
5	137	output	output	input	input
6	138	output	input	input	output
7	139	output	input	input	input
8	144	input	output	output	output
9	145	input	output	output	input
10	146	input	input	output	output
11	147	input	input	output	input
12	152	input	output	input	output
13	153	input	output	input	input
14	154	input	input	input	output
15	155	input	input	input	input

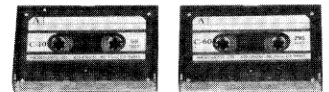
Table 2. Mode zero configurations for the 8255.

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different phonemes that emulate the English language using 6-bit access codes.

Sending out these different phonemes at a continuous rate produces synthesized speech. Table 3 lists the 64 different phonemes, their symbols, average duration time in milliseconds, and examples important in creating speech. You can create any word by combining the proper phonemes. I use a Basic program to test the hardware circuits by putting together phonemes to create actual speech (see the Program Listing).

Refer again to Fig. 2. Port B of the 8255 (U4) transfers the 6-bit phoneme code to the Votrax chip. Since the program sets the outputs of port B to latch, the phoneme code stays on the inputs (pins 9-14) of the SC-01 chip (U5) until the program sends a new one. Now that the phoneme code is on the SC-01's input pins, it must latch in through the STB input (pin 7). Latching occurs on a rising edge signal so that the PC0 of the 8255 is set high to latch in the pending phoneme code.

A time delay in the latching set-up time is necessary. The Votrax chip requires at least 100 microseconds to stabilize its internal circuits. After stabilization, the program sets the STB input high to latch in and hold the phoneme code. Due to this latching capability, the Votrax chip is capable of continually sending out the same code until it receives a new one.

Since each phoneme code has its own time duration, it's necessary to know when the SC-01 finishes creating it. This is where the acknowledge/request (A/R) output (pin 8) from the SC-01 comes into play. The A/R output indicates when the program should send the next phoneme. Upon completion of the phoneme, the A/R output goes from a low state to a high state. Since the A/R output is CMOS and the input to the 8255 is TTL, the A/R output doesn't have enough drive capability to operate

the TTL gate. U7 takes care of the interface requirement.

U7 (4049) is a hex inverter/buffer capable of driving two TTL loads. Since it has CMOS input and TTL-compatible output, the SC-01 and 8255 chips are completely compatible. The 4049 inverts the signals, while two gates keep U7B's input the same as U7A's output.

A 4050 CMOS chip also works in place of the 4049. The only difference between the two is that the 4050 doesn't invert the logic signals. Should you use a 4050 chip, you need only one gate. I used a 4049 because I had one available when I built the circuit.

*"You can synthesize
four different voices
or mix sounds together
to change the pitch
of a spoken sentence."*

Input PA0 (pin 4) of the 8255 constantly scans the state of the A/R output. When the A/R line goes from a low to a high state, it tells the controlling program to send another phoneme to the SC-01 chip. The sequence of events using the phoneme inputs, STB line, and A/R line continues until the controlling program stops sending new phoneme codes.

I1 (pin 3) and I2 (pin 2) represent the inflection inputs to the Votrax chip. These inputs let you change inflection or pitch for a higher- or lower-sounding output. This gives you the ability to synthesize four different voices or to mix sounds together to change the pitch of a spoken sentence.

Because inflection inputs must be at a constant logical state, they require external latches. The latched outputs of

PC1 and PC2 (pins 15 and 16) of U4 provide this function. The gates of U6 act as a buffer between U4 and U5 for the inflection inputs. Notice that the outputs of U6 are tied to 12 volts through 4.7K resistors. The inflection inputs require the same voltage as the SC-01's power supply and U6 provides this interfacing requirement. Remember this because the circuit doesn't function if U6's outputs are tied to 5 volts instead of 12 volts.

Gate U3C is one of two methods that uses interrupts to let the computer know it's time to send out another phoneme code via the 8255. The program sets the state of PC7 (pin 10) to high to enable the interrupt gate. When the A/R line signals the readiness for a new phoneme, its high output combines with PC7's output to give the required low signal for an interrupt.

The other method used is scanning PA0 for the low to high transition. I use this method and scan the PA0 input for a logic change. I set the interrupt usage aside for advanced applications in the future.

The master clock frequency inputs, MCRC and MCX, are connected to a resistor and a capacitor. These two inputs and components reach an oscillating frequency of approximately 720 kHz. This frequency sets up the standard phoneme timing so that, by varying the variable resistor, the voice and sound output change from a low pitch to a high pitch.

If you use the external clock source option instead of the internal one, the MCRC output (pin 16) is tied to ground while the external frequency source is applied to the MCX input (pin 15). Since I use the internal clock, both MCRC and MCX are tied together as shown in Fig. 2. The easiest way to adjust the internal clock is to send out a phoneme code or message and set the frequency for the most pleasing sound. I'll cover this in the testing section of this article.

I tied audio outputs CB, AF, and AO together so I could use them in conjunction with a class A amplifier. If you use these outputs in an amplifier other than a class A amplifier, separate them. I chose class A because it's popular and easy to build. The combined output of the three signals are tied to the amplifier's input shown in Fig. 3.

Figure 3 also shows the speech amplifier circuit, consisting of a pre-amp and a main amplifier. I decided to design an amplifier that could handle speakers larger than those in transistor radios to get better sound quality.

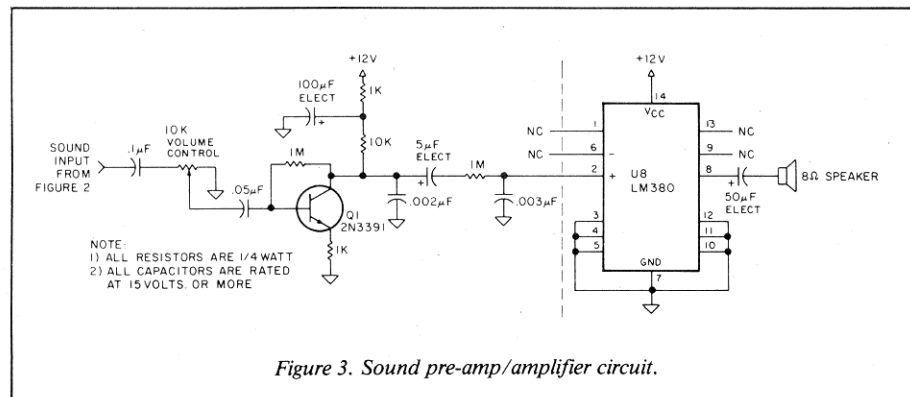


Figure 3. Sound pre-amp/amplifier circuit.

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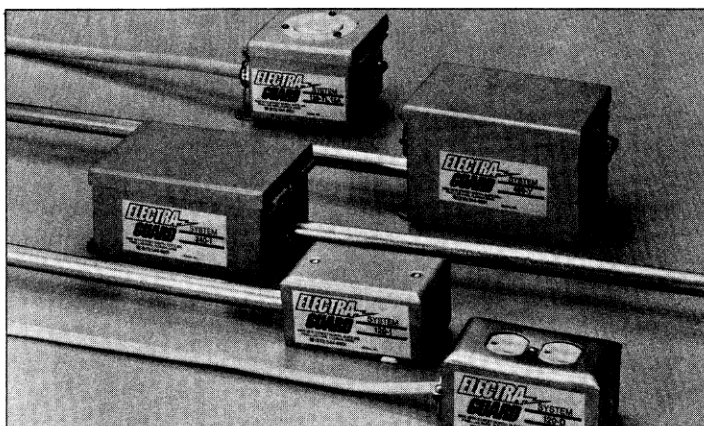
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The pre-amp section consists of everything to the left of the dotted line in Fig. 3. It conditions the signal from the SC-01 and sends it to the main amplifier section, to the right of the dotted line. Note that the volume control for the speaker is located in the pre-amp section.

U8 (LM380) is an amplifier chip capable of handling speaker loads of up to 2.5 watts with proper heat sinking. A typical 6-inch car speaker shouldn't present any heat problems when used with this amplifier chip. The pre-amp/amplifier circuit is powered from the same 12-volt supply that powers the Votrax chip.

Generating a Phoneme

Here is the sequence of events that creates a phoneme sound. First, enable the external bus with the command OUT 236,16 to allow any input or output from or to the computer (Model III only). The next step is to set the 8255 interface chip to mode zero, option 8, with the OUT 19,144 command. The OUT 17,'CODE' sends a phoneme

code to the Votrax chip through the 8255 (PB0 to PB5). Now consider the required set-up time delay.

If Basic controls the Votrax chip, a time delay loop isn't necessary due to the internal slow speed of the Basic language as compared to machine-language code. If you use machine-language code, the program loads register pair BC with a value and calls 60 hex for the time delay. I use this last method and will describe it under the Text-to-Speech program section next month.

After the controlling program sends the phoneme code to the SC-01 chip, the chip must latch in the code to start the sound output via the STB line input. Port 18 controls the 8255's PC0, PC1, PC2, and PC7 outputs. It always starts the SC-01 chip by making the STB line into a high state.

The value sent to port 18 controls the STB line, inflection levels, and enables gate U3C for interrupt control. The value must always be an odd number to ensure control of the STB line. The phoneme sounds when an OUT 18,X command latches in.

After phoneme generation, the program monitors the Votrax chip to know when to send out another code. Port 16 samples the 8255's PA0 input, which is the same as the A/R line. The program scans the A/R line in a loop until a positive value indicates the Votrax chip is ready for a new code. The Basic command that samples port 16 is A = INP (16). A positive value causes the entire sequence of events to start all over again with a new phoneme until stopped under program control.

Speech Construction

Regardless of the board system on which you build the circuit, be sure to use sockets for all the integrated circuits. Figure 4 shows the component layout of the speech board. Table 4 is the parts list for all the circuits.

Since there are a couple of CMOS chips in the circuit, especially the Votrax chip, take extra precautions to discharge static electricity when handling them. A good rule to practice is never to assemble a project in an area that has a rug beneath your feet. The rug can gen-

Phoneme Code	Phoneme Symbol	Duration (ms)	Example Word				
00	EH3	59	jacket	20	A	185	day
01	EH2	71	enlist	21	AY	65	day
02	EH1	121	heavy	22	Y1	80	yard
03	PA0	47	no sound	23	UH3	47	mission
04	DT	47	butter	24	AH	250	mop
05	A2	71	made	25	P	103	past
06	A1	103	made	26	O	185	cold
07	ZH	90	azure	27	I	185	pin
08	AH2	71	honest	28	U	185	move
09	I3	55	inhibit	29	Y	103	any
0A	I2	80	inhibit	2A	T	71	tap
0B	I1	121	inhibit	2B	R	90	red
0C	M	103	mat	2C	E	185	meet
0D	N	80	sun	2D	W	80	win
0E	B	71	bag	2E	AE	185	dad
0F	V	71	van	2F	AE1	103	after
10	CH*	71	chip	30	AW2	90	salty
11	SH	121	shop	31	UH2	71	about
12	Z	71	zoo	32	UH1	103	uncle
13	AW1	146	lawful	33	UH	185	cup
14	NG	121	thing	34	O2	80	for
15	AH1	146	father	35	O1	121	aboard
16	OO1	103	looking	36	IU	59	you
17	OO	185	book	37	U1	90	you
18	L	103	land	38	THV	80	the
19	K	80	trick	39	TH	71	thin
1A	J*	47	judge	3A	ER	146	bird
1B	H	71	hello	3B	EH	185	get
1C	G	71	get	3C	E1	121	be
1D	F	103	fast	3D	AW	250	call
1E	D	55	paid	3E	PA1	185	no sound
1F	S	90	pass	3F	STOP	47	no sound

/T/ must precede /CH/ to produce CH sound.
/D/ must precede /J/ to produce J sound.

Table 3. Phoneme chart.

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5 1/4" quad 420	5 1/4" quad 495	8" sin-side 295
5 1/4" dbl-side 420	5 1/4" dbl-side 445	8" sin-side 390
8" sin-side 275	8" sin-side 345	8" dbl-side 390
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power. The color codes make troubleshooting easy.

All of the control signals coming from the computer are labeled in the schematics. How you get them to the speech circuits is up to you. You have two options. You can run them directly from the computer or go through an interface like the one described in the March 1983 issue of *80 Micro* ("Real World, It's About Time!", p. 342).

If you don't build an interface, tie the appropriate signals from the Model III

to the speech circuits directly through a 50-pin edge connector and conductor cable. Use a 40-pin edge connector and conductor cable for a Model I. Table 1 shows the signals and pin-outs of the Model I and Model III expansion buses.

You can buy the 40- and 50-pin connectors from Radio Shack, but you'll have to get the cable from an electronics dealer. Run the appropriate signals to the designated inputs shown in Figs. 1 and 2. For the Model III, be sure to connect all the even cable conductors to ground as shown in Table 1. The Model I doesn't use this configuration. (The article referred to above explains the cable/conductor assembly in greater detail.)

I mount both the 5- and 12-volt regulators on opposite sides of the S-100 card. Be sure to mount these regulators on heat sinks to keep them cool. Install a 5 μ F electrolytic capacitor on each regulator's input lead to suppress any oscillations should they occur. These oscillations drop the output voltage to an undesirable value. Install the 100 μ F electrolytic capacitor across the SC-01's 12-volt power supply to ground as shown in Fig. 2 to prevent noise from entering the circuit.

Although it isn't required, I highly recommend that you add .01 μ F disk capacitors across each integrated circuit's power and ground pins. These ICs sometimes produce noise when they're involved in high-speed switching. The capacitors filter out most of it. I always mount mine on the back side of the S-100 card, soldering one lead directly to the chip's power input pin and the other to the chip's ground pin.

On completion of the speech board, check your circuits carefully for wiring errors, opens, and shorts before you apply power to the circuits. If everything checks out, apply power and measure the 5- and 12-volt supplies for correct operation. It's also a good idea to check each IC socket's power pins for voltage. Take time to read all of the SC-01's socket pins for voltages.

Use a miniature plug and socket to connect the speaker to the speech board as shown in the Photo. Install all of the pull-up resistors as shown in Fig. 2. These resistors ensure correct logic levels between the 8255 (U4) and SC-01 (U5) chips. I install my resistors on 14-pin component carriers to obtain a neater appearance.

With the power off, carefully install all of the ICs. Make sure you set the port address decode switches (S1 to S6) to decode the base port of 10 hex.

Decoder Section Parts List (Figure 1)

U1, U2	74LS136
U3	7400
U4	8255A
S1-S6	RS #275-1301
4-Filter Caps	.01 μ F @ 25V disk
7-Resistors	1k ohm @ 1/4 watt

Main Speech Circuit Parts List (Figure 2)

U4	8255A
U5	Votrax SC-01 chip
U6	7417
U7	4049
3-Filter Caps	.01 μ F @ 25V disk
1 Cap	120 pF cap @ 25V
1 Cap	100 μ F @ 25V electrolytic
Resistors are 1/4 watt:	
4.7k ohm	Quantity = 10
6.8k ohm	Quantity = 1
10k ohm pot	Quantity = 1 (any power rating)

Sound Amplifier Circuit Parts List (Figure 3)

U8	LM380
Q1	2N3391
Capacitors: (rated minimum of 25V)	
100 μ F elect.	Quantity = 1
50 μ F elect.	Quantity = 1
5 μ F elect.	Quantity = 1
.10 μ F	Quantity = 1
.05 μ F	Quantity = 1
.003 μ F	Quantity = 1
.002 μ F	Quantity = 1
Resistors are 1/4 watt:	
10k ohm pot	Quantity = 1 (any power rating)
1M ohm	Quantity = 2
10k ohm	Quantity = 1
1k ohm	Quantity = 2
Phone Jack	RS #274-249
8 ohm speaker	

Miscellaneous

Wameco QMB-12 Motherboard (if used)
 Vector 8802-1 S-100 card (if used)
 12V regulator
 5V regulator
 IC sockets
 PC board
 50 pin connector and cable (40 pin for Model I)
 Wire-wrap, power-supply heat sinks,
 solder, hardware, suitable enclosure

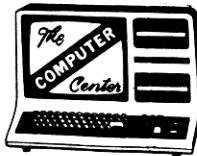
Table 4. Parts list.

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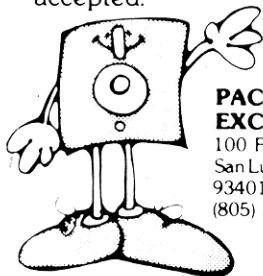
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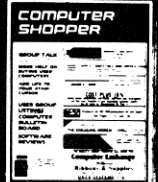
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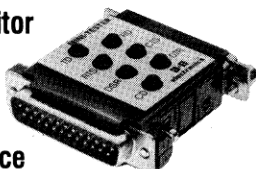
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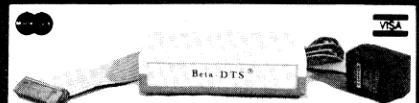
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Testing the Speech Board

The Program Listing is a Basic program that tests the speech board and sets up the master clock frequency. It is well-commented and follows my earlier discussion on the creation of phonemes. Type in and save the Listing. Turn on the speech board's power. You may hear a phoneme sounding at a constant rate due to the possible erratic power-up condition of the circuits. Type RUN to execute the test program.

The computer should now say "Hello, I am now a talking computer." After this message, the speech board is quiet since the last data value sent consists of the Votrax stop code of 63 decimal.

If the speech board doesn't talk, check the DIP switch to see if you selected the correct base port number. If the problem persists, recheck all your circuits for possible errors. If the board does talk, you can set the master clock frequency.

*"When you type RUN
to execute
the test program,
the computer should say
'Hello,
I am now
a talking computer.'"*

Change line 270 in the Listing to RUN. This puts the program into a continuous talk mode. Now run the program and adjust the variable resistor that changes the master clock frequency as shown in Fig. 2. Adjust this resistor to obtain the most pleasing sound pitch. When the sound pitch is set, check the inflection circuits.

To do so, modify the Listing once more. Change line 170 to INPUT "ENTER INFLECTION VALUE";VO. This lets you enter different inflection values to see how they change the voice output. Line 180 ensures that the value is odd between 1 and 7. If you use the interrupt option, add a value of 128 to the 1 to 7 value.

Run the program and enter odd values from 1-7 to hear how the voice changes pitch. You should be able to detect a total of four different voices. I

incorporate the ability to change the pitch or inflection inputs in the Text-To-Speech program, which I'll discuss next month. This lets you change pitch within sentences.

When you order and receive the Votrax chip, you also get the data sheets and a phonetic speech dictionary that gives you the codes to make up numerous words. The values in the data state-

ments located in the Listing were taken from this book. You must, however, go through a conversion process to obtain the correct decimal value for the data statements.

Refer again to Table 3. Note that each phoneme code has a hex value. You must convert this value to its decimal equivalent in order to put it into data statements. To make it easier, I put

```

10 '*****
20 '          L I S T I N G 1
30 '*****
40 '
50 '          TEST PROGRAM FOR THE SPEECH BOARD
60 '          BY
70 '          DAVID ENGELHARDT
80 '
90 '          05/04/83
100 '
110 ' THIS BASIC PROGRAM IS USED TO TEST THE
120 ' HARDWARE CIRCUITS.
130 '
140 '*****
150 '
160 CLS
170 VO=1
180 IF VO=1 OR VO=3 OR VO=5 OR VO= 7 THEN GOTO 190 ELSE 170
190 E=43
200 DATA 27,2,35,24,35,53,55,62,62 : ' HELLO
210 DATA 21,0,9,41,62,47,0,12,62 : ' I AM
220 DATA 13,21,35,55,62,6,33,41,62: ' NOW A
230 DATA 42,61,25,10,20,62 : ' TALKING
240 DATA 25,50,12,37,34,54,55,42,58,63: ' COMPUTER
250 '
260 GOSUB 5000 : ' DO IT.
270 STOP
280 '
290 '*****
300 ' THIS SUBROUTINE WILL MAKE THE VOTRAX CHIP TALK
310 '*****
320 '
5000 OUT236,16:
      ' ENABLE EXTERNAL BUS
5010 FORX=1 TO E: ' SET UP LOOP
5020 READ C: ' GET PHONEME CODE
5030 OUT19,144: ' SET 8255 FOR MODE 0
5040 OUT17,C: ' SEND PHONEME CODE
5050 OUT18,VO: ' LATCH CODE AND TALK
5060 A=INP(16):IFA=0 GOTO 5060 : ' SCAN A/R HIGH = DONE
5070 NEXT X: ' DO AGAIN
5080 RETURN
5090 END

```

Program Listing. Test speech program.

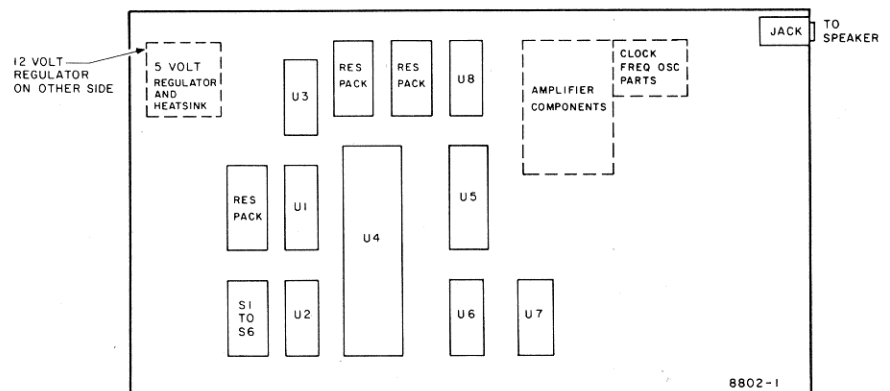


Figure 4. Parts placement for speech board.

the decimal equivalent just to the right of the hex value. Start with the phoneme code 00 and number them from zero to 63.

You can adapt the Listing to run in any Basic program. Just put the subroutine from lines 5000-5080 in your program with the appropriate data statements. Change the data statements and you can apply the talk feature to games, and so on. If the application requires only certain spoken phrases, you can save memory by putting them into data statements, when you use the Text-To-Speech program in next month's issue.

Using Table 3 might seem a little complicated at first, but it gets easier with experimentation. For practice, break the word "hello" down into its phoneme equivalent by using the example word pronunciations given in Table 3.

First find the H sound in the table, phoneme code 1B hex or 27 decimal. The next letter, E, comes closest in pronunciation to that in the word "enlist," so the phoneme code is 01 decimal. Since the next two letters are L's, add two decimal L codes, which are 24,24. The final code for the letter O is 38. The last value should always be the stop code of 63 for any spoken phrase.

Now put the decimal codes 27, 01, 24, 24, 38, and 63 into the first data statement in the Listing. Also, change the E value (line 190) to 6 for the loop count. Run the program and listen to the pronunciation of hello. You may find that some words need a little more work by adding a few extra phoneme codes.

For example, compare the phoneme codes for hello to those in the first data statement in the original Program Listing and you'll see what I mean.

When you get the speech board built and running, you're ready for the software that converts ASCII text to speech, as well as some practical applications. I'll present those next month, along with some instructions on how you can assemble the listings on your particular system. ■

Write to David Engelhardt at 10221 West 101st Place, Broomfield, CO 80020.

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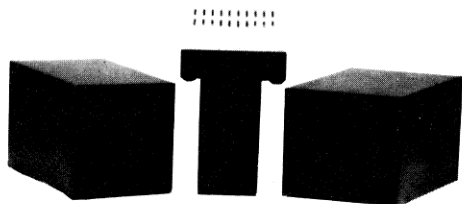
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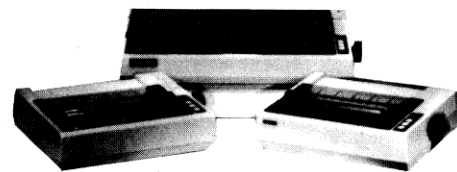
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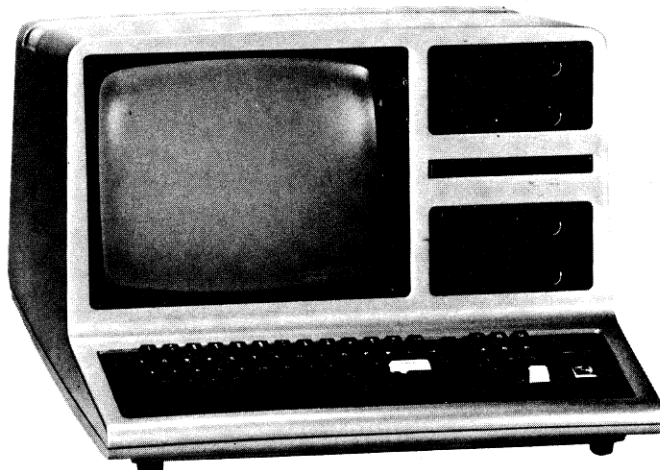
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Phantom Disk

by Donald Goss

When the Model 4 first hit the stores, most of us Radio Shack groupies were so dazzled by the 80×24 screen and the promised CP/M operating system that we overlooked the Memdisk feature. Unfortunately, the TRSDOS 6.0 manual that accompanies the Model 4 does a poor job of explaining Memdisk. So I'll describe the use of the Memdisk in random-access files.

The basic concept behind Memdisk—using a bank of random-access memory as a pseudo-disk—is by no means new. Usually referred to as a RAMdisk, it is useful to reduce the thrashing that accompanies a random-access search while simultaneously speeding up the search process.

While writing a data-base program for a small school, I learned how to use the Memdisk feature. Rather than quoting the program as I demonstrate

Use the Model 4's Memdisk utility instead of a real disk to speed random access searches.

Memdisk, I refer only to those aspects that illustrate the feature.

First, you must create and format Memdisk. If you have only one disk drive, Memdisk functions as drive 1. For the purpose of this illustration, I assume that you have two drives (zero and 1) and want to create a Memdisk as drive 2.

From the TRSDOS READY prompt, type SYSTEM (DRIVE=2,DRIVER="MEMDISK/DCT") and press the enter key. Answer the next prompt

with D to indicate that you want to use all 64K of upper memory.

Answer the following prompt by typing D to indicate that you want the pseudo-disk to be double density, then answer the prompt Do You Wish to Format It? by pressing the Y key. After formatting, you'll have 12 cylinders on the Memdisk with 4,608 bytes each, for a total of just over 55K of usable memory.

To access the pseudo-disk with the greatest speed, transfer some of the system modules from your TRSDOS disk to high memory.

You need only the first three modules for the functions associated with random-access files. To transfer these, type SYSTEM (SYSRES=1) and press the enter key. Repeat the command with =2 and =3 to transfer the other modules.

I assume that your program and data are on a disk in drive 1. My project contains a Basic program, named Program/BAS, a data file, Student/DAT and a short, one-record file Count/DAT that holds the counters on a disk in drive 1.

Use the Copy command to transfer the data file(s) over to drive 2, just as if

```
SET *PD CLICK/FLT
FILTER *KI *PD
SYSTEM (DRIVE=2,DRIVER="MEMDISK/DCT")
D
D
Y
SYSTEM (SYSRES=1)
SYSTEM (SYSRES=2)
SYSTEM (SYSRES=3)
COPY STUDENT/DAT:1 :2
COPY COUNT/DAT:1 :2
BASIC
CLS
LOAD "PROGRAM/BAS:1"
RUN
//STOP
```

Figure. Build Startup/JCL File.

The Key Box

Model 4
TRSDOS 6.0

it were a real disk drive. It's not necessary to transfer your program to Memdisk. At this point load Basic, load your program, and run it—accessing your data files in drive 2 just as you normally use random-access files.

You'll have to get used to not seeing the disk access lights go on and off periodically and to the speed of file access, which is surprisingly fast.

To simplify all of this, and to eliminate the possibility of errors, I suggest that you put this process into a Build file and execute it with the Do command.

From the TRSDOS READY prompt, type BUILD STARTUP/JCL and press the enter key. Then enter the commands in the Figure, substituting your own program names. I am including the click filter here, since this is unclear in the manual.

After following the instructions in the Figure, hold down the shift and control keys, and press the @ key to end the Build sequence. By typing DO STARTUP/JCL, you can execute all of the commands without error.

You can also set the disk to automatically perform all these tasks during boot-up by entering AUTO DO STARTUP/JCL. That way, after turning on your computer and entering the correct date, you'll have time to pour yourself another cup of coffee while your program executes. Depending on the length of your data files, you should have between 1½ and 2 minutes of execution time.

Make certain that you copy your data back to your data disk at the end of each session. Although you may begin to think of Memdisk as a very real and fast disk drive, when the power goes off, Memdisk's data disappears. To prevent this from spoiling your day, I suggest that you set up another Build file (EXIT/JCL) with the commands:

COPY STUDENT/DAT:2 :1
COPY COUNT/DAT:2 :1

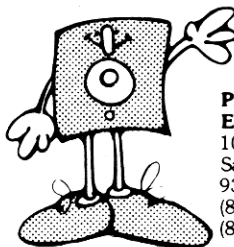
Then you can set up an orderly exit by typing SYSTEM "DO EXIT/JCL" instead of END, and so file your data away. By doing this, your data is always waiting for you on your next boot-up.

Happy filing! ■

Dr. Donald Goss is Chairman of the Division of Humanities at Volunteer State Community College in Gallatin, Tennessee. He can be reached at the Division of Humanities, Volunteer State Community College, Gallatin, TN 37066.

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The Bucks Start Here

by N.B. Parrish

You're expecting a tax refund, but you're not sure how to invest it. Use this program to evaluate the options, then enjoy the payoff.

Everyone knows there's no such thing as a free ride. You can, however, come close to getting something for nothing if you know where to invest your hard-earned money. This little Model III program can help (see the Program Listing). With the changes I've noted, this program also runs on a Model II, Model 100, and a Color Computer.

Those of you fortunate enough to receive an income tax refund this year may wonder what to do with it. If you decide to invest it, then additional questions arise.

How can you get the most return from your money investment? Do you invest in tax-free bonds or some other form of tax-free security? Is a fully taxable bond, treasury bill, or regular savings account best for you? Other factors, such as liquidity of assets, may be important to you, but if you want yield, read on.

Enter Uncle Sam

The answers depend on your federal income tax bracket. A while ago, I stumbled on an article in *Changing*

Times called "What is Tax-Free Income Worth to You?" It included a table comparing taxable and nontaxable yields for various tax brackets.

As usual, my bracket and the yield I wanted fell between those listed. In the process of interpolating up, down, and across, I lost my place. And I didn't know what to do about state and local taxes.

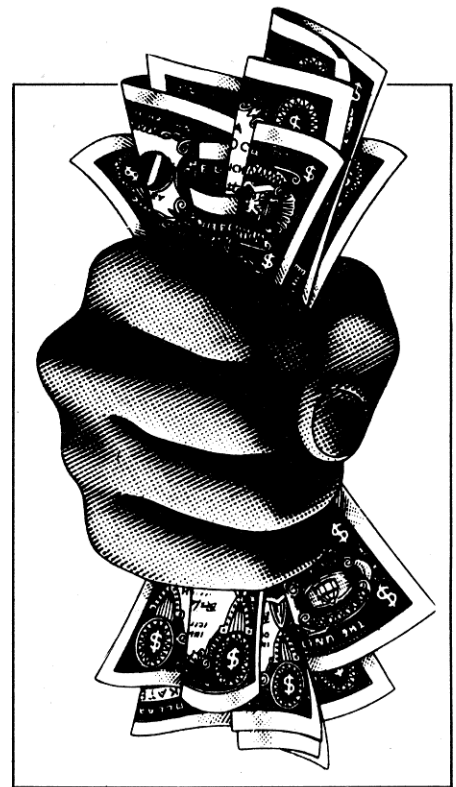
Instead of giving up, I wrote a program that brings all these factors together.

The Menu

The main menu has three options. The first calculates the break-even tax bracket for a specific taxable and nontaxable investment. The second option figures the tax-free equivalent of a taxable yield, while the third gives the taxable equivalent of a tax-free yield.

Sample Problem

Say you're in the 35 percent federal income tax bracket and have the choice between purchasing a taxable security yielding 10.55 percent and something that yields 7.75 percent tax-free.



The Key Box

Models I and III
 Model II (with changes)
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5 CLS: '-WRITTEN BY N.B. PARRISH, JR. - 2/15/82
7 SS="###.##"
10 PRINT@144,"TAXABLE VS TAX FREE INCOME"
20 GOSUB500:PRINT
30 PRINT"THIS PROGRAM COMPUTES EQUIVALENT YIELDS OF TAXABLE VS TA
X FREE INCOME DEPENDING UPON YOUR INCOME TAX BRACKET "
40 FORX=1TO2500:NEXT:CLS
50 PRINT@144,"SELECT DESIRED OPTION"
55 GOSUB500:PRINT
60 PRINT" 1.- MAX. TAX BRACKET TO BENEFIT FROM A SPECIFIED YIELD"
70 PRINT" 2.- TAX FREE EQUIVALENT OF A TAXABLE YIELD"
80 INPUT" 3.- TAXABLE EQUIVALENT OF A TAX FREE YIELD";B
100 ONBGOSUB200,300,400:PRINT:PRINT:INPUT"PRESS ENTER TO CONTINUE"
;P$
110 CLS:TA=0:RX=0:TG=0:ST=0:SS=0:TX=0:TT=0:CF=0:CD=0:TA=0:FI=0:FX=
0:FR=0:FE=0:ZZ=0:ZX=0:GOTO50
200 CLS:PRINT@134,"MAX. TAX BRACKET TO BENEFIT FROM A SPECIFIED YI
ELD"
205 GOSUB500:PRINT
210 INPUT"TAX FREE YIELD? (10%=10)";TF
220 INPUT"TAXABLE YIELD? (10%=10)";TY
225 INPUT"ENTER EXEMPTED STATE AND LOCAL TAXES, IF ANY";RT:RX=RT/1
00
230 TB=1-(TF/(TY-(RX*TY))):IFTF>TYTHEN260
240 PRINT:PRINT** IF YOU ARE IN THE ";USINGSS;TB*100;:PRINT"% OR
LOWER BRACKET, YOU WILL COME OUT BETTER BY OBTAINING THE TAXABLE Y
IELD"
250 PRINT"BUT, IF YOUR BRACKET IS GREATER THAN ";USINGSS;TB*100;:P
RINT"% , YOU WILL COME OUT AHEAD BY OBTAINING THE TAX FREE YIELD**"
:RETURN
260 PRINT:PRINT"INVALID ENTRY - TAX FREE YIELD IS GREATER THAN TAX
ABLE AND WOULD RESULT IN A NEGATIVE BRACKET. RE-ENTER DATA":GOTO21
0
300 CLS:PRINT@140,"TAX FREE EQUIVALENT OF A TAXABLE YIELD"
305 GOSUB500
310 PRINT:INPUT"ENTER YOUR INCOME TAX BRACKET (40%=40)";TA:TG=TA/1
00
315 INPUT"ENTER EXEMPTED STATE AND LOCAL TAXES, IF ANY (7%=7)";ST:
SS=ST/100
320 INPUT"TAXABLE YIELD? (10%=10)";TX:TT=TX/100
330 CD=TT*(1-(SS+(TG*(1-SS)))):CF=CD*100:PRINT
340 PRINT"A";TX;"% TAXABLE YIELD IN THE ";TA;"% TAX BRACKET IS EQUI
VALENT TO A TAX FREE YIELD OF";USINGSS;CF;:PRINT"%":RETURN
400 CLS:PRINT@140,"TAXABLE EQUIVALENT OF A TAX FREE YIELD"
405 GOSUB500
410 PRINT:INPUT"ENTER FEDERAL INCOME TAX BRACKET (40%=40)";FI
420 FX=FI/100:INPUT"ENTER EXEMPTED STATE AND LOCAL TAXES, IF ANY (
7%=7)";ST:SS=ST/100
430 INPUT"TAX FREE YIELD? (10%=10)";FR:FE=FR/100
440 ZZ=FE/(1-(SS+(FX*(1-SS)))):ZX=ZZ*100:PRINT
450 PRINT"A";FR;"% TAX FREE YIELD IN THE ";FI;"% TAX BRACKET IS EQ
UIVALENT TO A TAXABLE YIELD OF"; USING SS;ZX;:PRINT"%":RETURN
500 FORX=1TO64:PRINT"="";NEXT:RETURN

```

Program Listing. Evaluation of taxable and tax-free income.

Using option 3, the computer asks you for your income tax bracket. In this example, enter 35. Next, it prompts you to enter any state or local taxes. If none, simply press the enter key. For this example, assume 7 percent and enter 7. Finally, it asks you to input the tax-free yield (in this case 7.75 percent).

You find that a 7.75 percent tax-free yield in this case is equivalent to a 12.82 percent taxable yield. Which investment would you rather have?

If you deal in bonds, there are other considerations (such as whether you should buy at greater- or less-than-face value, and long term capital gains and losses). If in doubt, see your investment counselor or broker.

Program Conversions

The program listed here is for the Model III, and since there are no laser-zap sound effects or spectacular graphics, it works on most computers with a few conversions.

For the Color Computer, Model II, and Model 100, change all PRINT@ statements in lines 10, 50, 200, 300, and 400 to PRINT statements. Instead of specifying an X value of 1 to 64 in line 500, change it to 1 to 80 for the Model II and 1 to 40 for the Model 100.

For use on the Color Computer change line 500 to:

```
500 PRINT STRING$(32 "=");:RETURN
```

See you at the bank. ■

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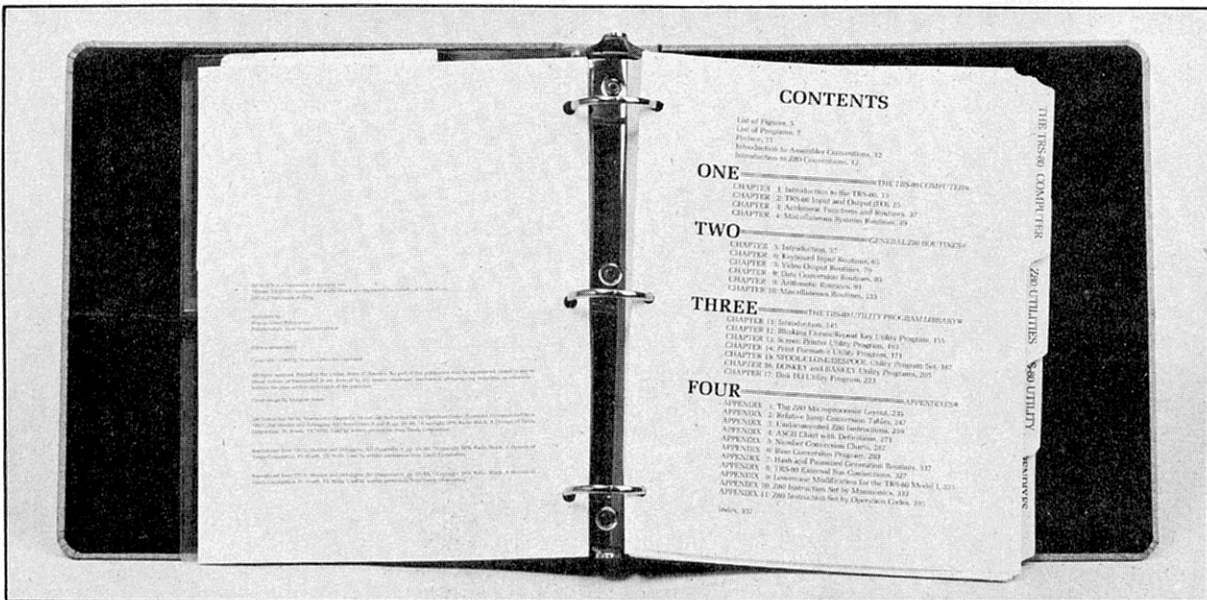
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Bill of Fair Repair

by Terry Kepner

One of the decisions Radio Shack computer owners face is whether to buy upgrade equipment from Radio Shack or from a less expensive, independent source. Similar to this decision is whether to modify the hardware in your computer yourself (such as adding a true uppercase/lowercase modification to your Color Computer, or adding non-Tandy memory to your Model III) or take it to Radio Shack.

Radio Shack's Hard Line

In the past, Radio Shack insisted that its customers patronize only Radio Shack company stores or associate dealers when shopping for upgrade equipment. Many times Tandy has said that it can't and won't work on, or provide repair support for, equipment manufactured by outside companies or for modifications made by unauthorized individuals. Tandy used to refuse to repair any modified computers, even when the problem was obviously the Radio Shack equipment and not the modification. This generated ill will and rapid growth of a new "cottage" industry—repairing modified Radio Shack computers.

This new industry has spawned horror stories of modified computer owners and the difficulties they have getting their machines repaired. Stories of burned-out chips, expensive and unending repair trips, and shoddy workmanship abound.

Radio Shack usually advertises a 90-day warranty. This warranty means that Radio Shack makes any repairs required due to manufacturing defects free of charge. Any repairs needed after the warranty period are charged at a basic labor rate, plus the cost of parts.

You void the warranty if you open the case of the computer and install

Here's the low-down on repair costs for your TRS-80—whether Tandy or an independent works on it.

non-Radio Shack equipment or make modifications to the existing equipment. Officially, the repair technicians consider the warranty void if the case has been opened, even if no alterations to the Radio Shack equipment are made. Fortunately, most technicians are more lenient than this official policy.

Change of Heart

Last year Radio Shack relaxed its hard-line stance on repairing out-of-warranty (modified) equipment. Radio Shack now allows its technicians to work on computers that have non-Radio Shack alterations or additions, but only when the non-Radio Shack modifications don't affect the problem being corrected.

This means that if you add non-Radio Shack disk drives to your computer and begin experiencing memory problems, Radio Shack will unplug your drives and test the computer. If the Radio Shack memory is bad, they'll replace it. If the added memory is bad, Radio Shack charges a minimum "check-out" charge, and you must replace the bad memory. (Optionally, the Radio Shack technician can remove the non-Radio Shack modifications and return the unit to its standard setup. There is a charge for this service.)

If, on the other hand, you begin having disk input/output problems with your non-Tandy drives, don't bother asking Radio Shack for help. You have

to go to the company that sold you the disk drives, because Radio Shack works only on its own drives.

This is a reasonable position to take. Radio Shack technicians have repair manuals only for Tandy equipment, and their training is similarly restricted. Just because the foreign equipment is compatible with the Radio Shack computer doesn't mean that the parts, and design, inside the equipment are identical with Radio Shack equipment.

Radio Shack's new attitude makes the decision involving foreign equipment easier. Now you know that Radio Shack will take care of the basic equipment in your computer. You must take care of any unauthorized equipment or modifications.

Repair Rates

This leaves you in a delicate position. The main reason for purchasing non-Radio Shack equipment is cost. But once you have the equipment, how do you repair it, and how do you know what represents a fair repair cost? Saving \$200 by buying a disk drive from someone else isn't much of a savings if you have to spend \$300 to repair it a year later.

Before buying non-Tandy equipment, ask the manufacturer what its policies are regarding repair work, and if it recommends any local technicians who can take care of its merchandise. Most important, ask about technical manuals for the equipment (I strongly suggest you do this. That way when you find a technician, you don't have to wait for him to write the manufacturer for repair manuals before he can begin working on your computer).

When your computer malfunctions, you must determine where the problem lies—in the Radio Shack equipment, or

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Accounts Receivable 1. Daily Transactions Report 2. Invoices (with or without preprinted forms) 3. Statements (with or without pre-printed forms) 4. Summary Aging Report 5. Detailed Aging Report 6. Itemized Monthly Transactions 7. Detailed Customer Activity Report 8. Summary Customer Account Report

Accounts Payable 1. Daily Voucher Report 2. Daily Credit Report 3. Checks with Detailed stubs 4. Check Register 5. General Ledger Transfer Report 6. Cash Requirements Report 7. Transaction Register 8. Open Voucher Report 9. Aged Payables Report 10. Detailed Vendor Activity Report 11. Summary Vendor Account Report

Payroll 1. Federal Tax Tables 2. State Tax Tables 3. Payroll checks with stubs 4. Payroll Check Register 5. Monthly Payroll Summary 6. Quarterly Payroll Summary 7. General Ledger Transfer Report 8. Detailed Employee File Listing 9. Produces 941 Worksheet 10. Prints annual W-2 Forms

System Requirements: Either CP/M® or MS-DOS (PC-DOS) • Microsoft BASIC • 64K RAM • Two disk drives or hard disk • 132 column wide carriage printer, or an 8 1/2" x 11" printer with compressed print mode (an Epson MX-80 or similar printer).

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Order Desktop Accountant and evaluate it yourself for 30 days. Test the performance of each program using our comprehensive **Sample Data Files** to enter and process data, query accounts, print checks and reports, and more. Review the five User's Manuals, hear the Training Tape, read the users' Newsletter, even call our Technical Support Group with your questions. **You must be completely satisfied** with Desktop Accountant or you may return it in good condition with the **Sealed Master Disk UNOPENED** (it installs your live data) for a prompt, courteous, complete refund!



**ROCKY MOUNTAIN
SOFTWARE SYSTEMS**
Specialists in Accounting Software

in the foreign equipment. Sometimes it's easy, sometimes it isn't. If the problem is with the non-Radio Shack equipment, take your computer to an outside repair technician. If Radio Shack's equipment is at fault, you have a choice: take your computer to a Radio Shack computer repair center or take it to an outside technician. The decision is up to you, and will probably be based on cost.

Radio Shack's policy is that it charges a basic rate for any computer brought in for repair work that's out of warranty (see Table 1). Additionally, if you bring in a peripheral (printer, modem, Vox Box, etc.) at the same time Radio Shack charges an additional \$5 for each peripheral the technician checks out with the CPU. If the peripheral is brought in at the request of the service center, then they don't charge you. If you bring in the peripheral separately, there is an appropriate service charge (see Table 1) i.e., the Vox Box repair service charge is normally \$15. If you bring it in with the CPU for checkout, the charge is only \$5

for the Vox Box, plus \$15 for the CPU checkout.

The policy for installing kits is similar. If you install more than one upgrade kit, the highest labor charge is at list price, while the additional kits' labor charge is discounted by 30 percent. If you are installing multiple RAM or ROM upgrades all at the same time, then Radio Shack charges only the base labor rate for one installation. For example, installing three 26-1102 RAM kits in the same computer has a single labor charge of \$15.

If the equipment has any non-Radio Shack parts or modifications, the rates in Table 1 don't apply. Instead the repair cost is \$15 per half hour. These prices don't include the cost of parts required for the repair.

Table 1 is a listing of the current service charges and checkout charges Radio Shack uses. These prices are subject to change without notice, but if past experience is any indication, the prices should be good for about a year.

Any Radio Shack computer product (catalog #26-xxxx) not listed in Table 1 has a maximum checkout of \$30 for all CPUs and \$15 for all other items. As a matter of policy, any checkout charge billed within 45 days of a repair is credited against the labor charge for that repair. The amount credited does not exceed the labor charge.

The primary use of Table 1, for those with modified computers, is to determine a fair rate for repair work by independent repair technicians. If Radio Shack charges \$25 to align a disk drive, an independent technician shouldn't charge much more (usually, it's less).

If your computer is unmodified, and contains only Radio Shack parts, Table 1 gives you a good idea of what to expect when you take your computer in for repairs. ■

You can reach Terry Kepner c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.

Table 1. Radio Shack computer service charges.

Catalog Number	Description of Service	Service Charge	Checkout Charge
26-100X	Repair Model I CPU (Maximum labor = \$30.00, maximum parts = \$50.00)	\$15.00/½ hr	\$15.00
26-1006	Install DISD Modification	\$50.00	(NO DISCOUNT)
26-106X	Repair Model III w/o Drives (Maximum labor = \$30.00, maximum parts = \$45.00)	\$15.00/½ hr	\$15.00
26-106X	Install REV "B" ROM "C" (includes parts)	\$20.00	N/A
26-106X	Install Network III Download ROM "C" in shop (On Site charge is time and material)	\$15.00	N/A
26-1101	Install 16K RAM & Keypad (note 1)	\$30.00	N/A
26-1102	Install 16K RAM (note 2)	\$15.00	N/A
26-1103	Install Keypad (note 1)	\$15.00	N/A
26-1104	Install Lowercase (note 1)	\$15.00	N/A
26-1120	Install Level II Basic (note 2)	\$15.00	N/A
26-1121	Install Model III Basic and 16K RAM (note 2)	\$15.00	N/A
26-1125	Install Model III Hi Res Graphics Kit	\$30.00	\$10.00
26-1131 new	Install Model I/III Hard Drive 1/2/3 Slave	\$30.00	\$15.00
26-1140/1/2	Repair Expansion Interface *(1 hr. max)	\$15.00/½ hr	\$10.00
	Repair Buffer Cable	\$15.00	N/A
26-1143	Install Double Density Adapter	\$15.00	N/A
26-1145	Repair RS-232C	\$15.00	\$10.00
26-1145	Install RS-232C connector if req'd	\$15.00	N/A
26-1148	Install RS-232C (note 1)	\$15.00	N/A
26-1150	Install Tractor Feed (AXX-5006)	\$30.00	N/A
26-1158	Install New Revision ROM	\$30.00	N/A
26-1158	Replace Line Feed motor	\$15.00	(NO DISCOUNT)
26-1160/1/4	Repair and/or Align Disk Drive	\$30.00	\$10.00
26-1162	Install Disk Drive #0	\$30.00	N/A
26-1163	Install Disk Drive #1 (note 1)	\$15.00	N/A
26-1170	Repair Telephone Interface I *(1 hr. max)	\$15.00/½ hr	\$10.00
26-1171	Repair Telephone Interface II *(1 hr. max)	\$15.00/½ hr	\$10.00
26-1172	Repair Modem I (1 hr. max)	\$15.00/½ hr	\$10.00
26-1173	Repair Modem II (1 hr. max)	\$15.00/½ hr	\$10.00

Table continued

Catalog Number	Description of Service	Service Charge	Checkout Charge
<i>Table continued</i>			
26-1174	Repair AC 3 Modem (1 hr. max)	\$15.00	\$10.00
26-1180	Repair Voice Synthesizer	\$15.00	\$ 5.00
26-1181	Repair Vox Box (1 hr. max)	\$15.00/½ hr	\$ 5.00
26-1182	Repair Plug'n Power Controller	\$10.00	\$ 5.00
26-1190	Install New Revision ROM	\$15.00	N/A
26-120X	Repair/Align Cassette Recorder	\$15.00	\$ 5.00
26-1210/11/12	Repair Network I/II/III (1 hr. max)	\$15.00/½ hr	\$10.00
26-1260	Install Envelope Feeder for 26-1158	\$45.00	\$10.00
26-1411	Repair Printer Interface Cable	\$15.00	\$ 5.00
26-1429	Repair Auto Control Power Strip	\$15.00	\$ 5.00
26-1448	Install Single Sheet Feeder for 26-1158	\$45.00	\$10.00
26-1451	Repair Line Filter	\$15.00	\$ 5.00
26-1498	Repair Parallel Printer Switch	\$15.00	\$ 5.00
26-1499	Repair RS-232C Selector Switch	\$15.00	\$ 5.00
26-300X	Repair Color Computer	\$15.00/½ hr	\$15.00
	(Maximum labor = \$30.00, maximum parts = \$20.00)		
26-300X	Install RFI Disk Clip Kit (Charged to 0097)	\$15.00	(NO DISCOUNT)
26-3015	Install 16K RAM	\$15.00	N/A
26-3015/18	Install 16K RAM and Extended Basic ROM	\$15.00	N/A
26-3017/18	Install 32K RAM and Extended Basic ROM	\$30.00	N/A
26-3017	Install 32K RAM	\$30.00	N/A
26-3018	Install Extended Basic ROM	\$15.00	N/A
26-3022	Repair and/or Align Controller	\$15.00	\$10.00
26-3022/23	Repair and/or Align Drive	\$30.00	\$10.00
26-3501	Repair Pocket Computer 1	\$30.00	\$10.00
26-3503	Repair Pocket Computer 1 Cassette Interface	\$15.00	\$ 5.00
26-3505	Repair Pocket Computer 1 Printer	\$30.00	\$10.00
26-3601	Repair Pocket Computer 2	\$30.00	\$10.00
26-3605	Repair Pocket Computer 2 Printer/Plotter	\$30.00	\$10.00
26-3615	Repair PC 2 4K RAM Module	\$15.00	N/A
26-3616	Repair PC 2 8K RAM Module	\$15.00	N/A
26-3801/2 (new)	Repair Model 100	\$15.00/½ hr	\$10.00
26-3801 (new)	Install 8K RAM for Model 100 (note 2)	\$15.00	N/A
26-400X	Install DMA Modification (TT # II:49)	\$15.00	N/A
26-4102	Install 32K RAM (note 1)	\$15.00	N/A
26-4104	Install Hi Res Graphics Kit (note 1)	\$30.00	\$10.00
	Install in Model 12 (no video align) (note 1)	\$15.00	\$10.00
	(\$15.00 additional if video alignment req'd)		
26-4105	Install 64K VisiCalc RAM Board (note 1)	\$15.00	N/A
26-4150/2	Install Primary Hard Drive Kit (note 1)	\$60.00	\$15.00
	Install in Model 12 (note 1)	\$15.00	\$15.00
26-4153	Install 12 meg slave 1/2/3	\$30.00	
26-4163/4	Install Drive Kit (Model II Bay) (note 1)	\$30.00	N/A
26-4167	Install Drive Kit (Model 16 Bay/CPU) (note 1)	\$30.00	N/A
26-4715/16	Install Bi sync Modification (TT # II:38)	\$15.00	N/A
	Install Model 12 Bi sync	\$30.00	
	(On Site charge is time and material)		
26-5000/1/2	Repair Videotex	\$15.00/½ hr	\$15.00
	(Maximum labor = \$30.00, maximum parts = \$20.00)		
26-6010	Install Model 16 Enhancement Option (note 1)	\$45.00	N/A
	Install 6010 in Model 12 (note 1)	\$15.00	N/A
26-6011	Install 128K RAM Board (note 1)	\$15.00	N/A
26-6012	Install 128K RAM Kit (note 2)	\$15.00	N/A
26-6017	Install Model 12 Card Cage	\$30.00	N/A
26-6050	Repair DT 1 Terminal	\$15.00/½ hr	\$15.00
	(Maximum labor = \$30.00)		
76-1001	Repair PT 210 Terminal	\$15.00/½ hr	\$15.00
76-1009 (new)	Exchange DC1200 Modem Board		\$15.00

Note 1: If more than one kit is being installed at the same time in the same machine, the highest labor will be charged at listed price; each additional kit's labor will be discounted by 30%.

Note 2: If multiple RAM and/or ROM upgrades are installed in the same machine at the same time, then only one base labor rate is to be charged. Example—Installing two 26-1102 RAM kits in the same machine is charged at \$15.00 labor.

DiskCountTM Data

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QUALITY PROGRAMS
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6 NEW PROGRAMS FOR THE HOLIDAYS

All MOD III programs specified in this ad will run on the Model 4 (in the MOD III mode).

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VERSION 3.2
By Powersoft

SU+ 3.2	79.95
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**NEW SUPER UTILITY+
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Includes Operators Manual
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A 19.95 Value at no extra charge
Experience a legend with the
program voted as the outstanding
utility of 1982.

MOD I or MOD III Protected Media

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Retail	49.95
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**NOW
44.95**

Infoscan is an information utility that is used to organize, store and retrieve any type of useful information in any format. It combines the features of a word processor, data base manager and information retrieval and display utility. You compose information records on the screen using the word processing feature in any format you like. Each record is described by 1-17 characters, you choose that you specify. Once created the information, these keyphrases can be scanned as a list or the screen using an impressive key scan to select the keyphrases. Then the disk with the arrow keys on your keyboard, then the desired keyphrase is found, you press a single key and the corresponding information record is retrieved from disk and displayed on the screen. The records displayed are in the same format as you used to create them. You can then design your own forms to fill in.

A floating visual presentation utilizes the display window technique. Manual keyphrase lists, displayed text and status information are displayed in a series of display windows on your screen. Impressive graphics display panels are used to enhance the visual orientation of the product and your information.

MOD I/III MINIMUM 48K 1 Drive

MULTIDOS
BY Cosmopolitan Electronics
Reads Other Operating Systems

VERSION 1.6 \$89.95 Now 84.95
The latest release of an outstanding operating system or

Buy **VERSION 1.5 MOD I** or
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Reduced to 59.95

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PCHECK/CMD PFIX/CMD PREFORM/CMD PVC/CMD PERASE/CMD PMOVE/CMD PORT/CMD PASSGO/CMD PUN/CMD PEX/CMD PMOD/CMD PFIND/CMD	PCMPARE/CMD PSS/CMD PMAP/CMD PMX/FLT MX80 PHELP/CMD PBOOT/CMD PFLT/FLT DVORAK/FLT DVORAK/JCL CODE/JCL DECODE/JCL
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MOD I or MOD III

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The ULTIMATE in graphics design. This version is MUCH MORE POWERFUL than previous versions and includes BETTER documentation as well. New features include AUTODRAW™ and CIRCLE commands. Now allows you to design your own character sets! Includes lots of examples on disk. Your screen is only a "picture window" to a much larger drawing area. You are only limited by disk storage, not memory! Works on EPSON Series (Graftrax or Graftrax+ required) or the C-100 8510 (PROWRITER or NEC version). Now available for DMP-2100, DMP400 and LP-8. SPECIFY PRINTER

**SAVE OVER
15% NOW
49.95**

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EDAS** By Misosys

LC Compiler Retail	\$100
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SPECIAL BUY	\$139.99

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\$60**

Now program in the "C" language compiler subset for LDOS. LC generates Z-80 EDAS IV source code as output. Compiled programs run on both MOD I and MOD III. Save \$60.00 with the best LDOS editor assembler package on the market. Over 200 pages of documentation. Requires 2 drives and 48K.

FOR LDOS MOD I/III

THE TEST GENERATOR
By Big G Software

**ATTENTION
EDUCATORS AND STUDENTS**

**ONLY
34.95**

STUDENTS
This program is an ideal study aid for home computer use. A student types in review questions, vocabulary words, notes, etc. and the computer asks the questions. The student has two chances to answer correctly the computer gives a score and shows questions answered incorrectly. The student then has the option to re-try incorrect answers.

TEACHERS
Type in up to 100 questions and answers to compose a test. The test may be printed in Multiple Choice, Matching, True-False, or Short Answer format. Questions may be printed in order or at random. Answers may be printed in questions and questions as answers. An answer key is automatically printed for each test. Tests may be duplicated using Xerox, spirit masters, etc.

MOD III

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By Computer Shack

Manufacturers Suggested List	49.95
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- Build a Complete Library of All Your Programs
- Automatic Backup Recognition
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A great new directory program with its own operating system written by Vernon Hestor. This program will read any DOS there is even compatibility between MOD I and MOD III with double installed. The MOD I program can read most MOD III disks and the MOD III program can read most MOD I disks. 80 track double density is also supported.

**READS
ALL DOS
SYSTEMS**

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THE SHADOW**
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Formerly Manufactured by
ADVANCED OPERATING SYSTEMS

Now a DiskCount Data exclusive
The industry's standard and the finest break point disassembler and machine language monitor available. The package includes a rich, padded excel monitor and complete 2 color documentation. Now single step through your COM files, view & change assembly up-codes, memory, etc. Used by Kim Watt for the editing of SuperUtility+.

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SAVE

*MOD III
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BASIC
46.99

GAMEPAK 3
by Micro Mining

**ONLY
29.95**

3 GAMES FOR THE PRICE OF ONE

This package by James Talley of Kid Venture fame includes 3 games on the same disk. Funny Face is a program that draws over 1 million different faces on the screen as you select the different facial features. You can play "line up" where you select the face from up to 6 like faces, or have the computer draw faces in the automatic mode. Matchmaker is a program like the TV game "Concentration" where you select identical graphics matches from a grid. It keeps a running point score. Repeat After Me emulates the famous "Simon" game where you have to enter a repeat sequence of numbers to match the computer. Sound included. Funny Face alone is well worth the price. Kids will adore this 3 game selection.

MOD III

CLEAN SLATE by
Advanced Operating Systems

**ONLY
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A very unique word processing package. Clean Slate has many features not found in word processors at twice the price. It allows full customization of printer drivers and direct control of this printer from text. Features user definable repeat keys, non-destructive cursor, graphics print offset, custom keyboard driver and has it's own built-in command program for file transmission and receipt. Can build a separate glossary file, and a names list for auto from letter insertion. You can also create and edit assembly source or basic program files. We found a treasure chest of this little known jewel at the right price. Two color documentation in a padded easle binder, it is an outstanding value for this price.

MOD I/III

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PRINTER DRIVERS**

This new generation of custom printer drivers allows you to utilize all of SUPERSCRIPIT'S features with your EPSON (Graftrax Required), PROWRITER and CITHO F-10 STARWRITER printers. You can now utilize all of the printers custom features such as compressed, expanded and proportional print, underlining, bold-face, super-scripting, and sub-scripting. All drivers can be called from within SUPERSCRIPIT at "document open time." Order by printer designation as follows:

POWERDRIVER E	EPSON MX70/80/100
POWERDRIVER P	CITHO PROWRITER
POWERDRIVER S	CITHO STARWRITER

MOD I or MOD III

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This communications package is one of the most versatile available. It includes a full featured intelligent terminal program, host program, direct file transfer function, and hex conversion utilities for bulletin board downloading. Support for virtually all manual and auto dial modems. Exclusive Ultra Term direct disk file transfer function allows full control from the transmitting computer, and uninterrupted operation at the receiving computer. Split screen feature lets you type outgoing messages on the bottom half of the screen while incoming messages are displayed on the top of the screen. Full line printer support. Universal ASCII format file transmission and reception with memory input/output buffer supports delays between characters, delays between lines, and prompt controlled transmission for compatibility with virtually all systems. A counter continuously displays the amount of free memory remaining whenever the buffer is in use. Full featured host program that supports PRINT and PRINT graphics from basic and automatically re-locates and protects itself in the top of memory is included. Auto Dial phone numbers stored in program with single Key Auto Dial.

MOD I or MOD III

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- Unlimited annual transactions, fiscal or calendar year
- Transactions may be split among different budget categories
- Flags transactions for tax purposes
- Maintains transaction history
- Provides H-Rac graphics for any category by bar graph

The program itself does just about everything you ask of a personal finance package. Popular Computing, November, 1982.

MOD III

POWERMAIL PLUS

By Powersoft

Retail 150.00
Special 112.50**SAVE
25%****Features Over the Original PowerMAIL**

Separates any category for you in any manner you wish. This new version can span drives and may use multiple floppies. The program will sort on any eight levels if you wish. Separates your flags and puts them into another file. Print Options: Labels & Listing. One choice is the simple telephone book type listing. Two of the other modes give you not only the listing of names but also either FLAG numbers or the actual FLAG descriptions. The final print mode is what we call THE SALESMAN'S NOTEBOOK™. It prints out the whole list or whatever parts you specify with all info including full flag descriptions in each record. Then the word Notes™ is printed with several lines of blank space for making those notes in the field.

MOD I/III/4 2/12/16
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Complete diagnostic tests for components of your TRS 80. Separate tests for:

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MOD I or MOD III

PowerDRAW

by Powersoft

Retail 39.95
Special 34.95**SAVE OVER
10%**

A full screen graphics editor. POWERDRAW is 100% assembly language. You can create screens of graphics, save to disk, merge them, run in sequence like a movie, merge text with graphics, and write your own game or business application screens! PowerDRAW saves graphics to disk or tape so that they can be recalled at a later time in the following formats:

- | | |
|---------------------------|-----------------------|
| 01: CONDENSED TOKENS | 41: BASIC Strings |
| 11: EDAS Source file | 51: BASIC arrays |
| 21: EDASW Source file | 61: (New version 1.3) |
| 31: BASIC data statements | 71: Load File Format |

THE TOOLBELT MOD 4

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Powersoft does it again with a collection of 16 of the most popular LDOS TOOLBOX utilities re-published for TRSDOS 6.0 running on the MODEL 4. Now enhance your MOD 4 TRSDOS with this powerful set of utilities. Complete with detailed manual on how to use each utility program to do the many things the TOOLBOX for LDOS was famous for.

Model 4

GRAPHIT

by Powersoft

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39.95**

A simple, easy-to-use program for portraying graphs on a microcomputer. Creates and uses files in Visicalc DIF format, so it will be able to graph Visicalc data as well! Graphs may be changed at the touch of a key, graph scales can be compressed or expanded. Display and print just one portion of the graph or all of it at once. Extremely user-friendly and contains multiple HELP screens. GRAPHIT will print the raw data and produce graphs on any lineprinter. No special lineprinter options required.

MOD I/III

ELECTRIC WEBSTER

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149.95* SAVE 20%
WITH CORRECTING FEATURE**ONLY
119.95****ENIGMA**

by Powersoft

**ONLY
39.95**

This encryption program is based on the ENIGMA cipher machine used by the Germans in the Second World War. It incorporates the improvements which by the admission of Allied Intelligence who participated in cracking the Enigma code would have made the system almost completely impenetrable! A 29-character key is used for encrypting textual material yielding over TRILLIONS of possible keys and encoding combinations. A technical description of the German ENIGMA machine and how it is simulated (and improved upon) is given in the manual. The perfect program for students of cryptography, business persons who want to transmit sensitive data over open data links (voice or modem) or TELETYPE lines, and anyone else who wishes to maintain confidential information.

MOD I/III

EPSON™ Driver Compiler

by Powersoft

29.95

This is a program which allows you to construct your own printer character table for an EPSON bit-graphics printer, and compile a relocating printer driver which will produce those characters! Character tables can be saved to disk and manipulated in a variety of ways (including rotation of each character 90, 180 or 270 degrees) before the actual compile process. Several example files are included on the disk. This program requires an EPSON MX-80 with GRAFTRAX or GRAFTRAX-Plus, or an FX-80.

Mod I/III

MORE DISKCOUNTS

PROGRAM NAME	SPECIAL
BASIC S COMPILER SYSTEM I/III	39.95
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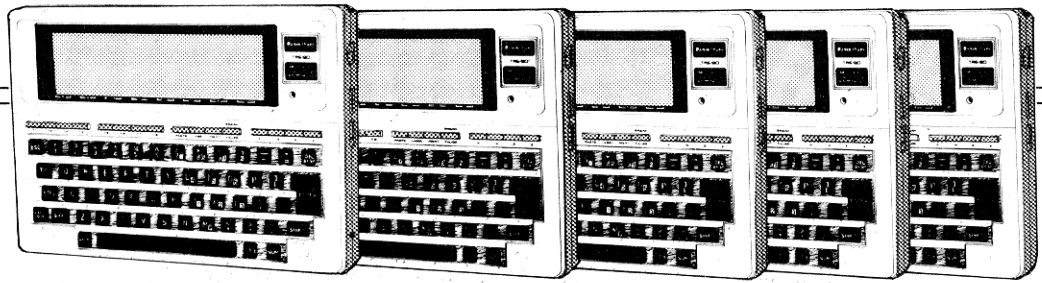
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Mnemonic Powers

by Dan Robinson

Radio Shack's Model 100 is a chip off the old block, so to speak. It uses a low-powered version of the 8085 central processing unit (CPU) and its instruction set is almost identical to that of the 8080 chip.

Since the Z80 CPU that drives the Models I, II, III, and 4 is upwardly compatible with the 8080, most of the 100's 8085 instructions should be familiar to Model I/II/III/4 Assembly-language programmers. But some significant differences exist. I'll go over them and provide you with a table listing the command mnemonics for each chip.

The primary differences between the chips arise from the fact that the 8085 is short a few registers. It has no IX and IY index registers, and no primed alternate register set. Also, the 8085 has no instruction to directly load the interrupt register. Instead, a pair of RIM and SIM instructions use a bit pattern

in the A register to set the interrupt mask and data bus, and to perform a restart instruction. The restart instructions—numbered RST zero through 7—work from locations in the first 64 bytes of memory.

The 8085 doesn't support relative jumps, and is missing the set and reset bit tests. The miscellaneous instructions that compare blocks and moves are also missing, as are the CB, ED, DD, and FD families of instructions.

In theory, it's possible to use Model I/III utilities such as EDTASM to write assembler code for the Model 100, but you'll have to avoid commands that the Model 100 doesn't support. The object is to send code to the Model 100 through a modem while filtering out unsupported loading codes.

Intel uses its own jargon with the 8085 (MOV instead of LD, for example). Since Z80 terms are currently more familiar to TRS-80 owners, you're likely to see many Zilog words applied to the 8085. Table 1 helps you make the translation. ■

You can reach Dan Robinson at 1625 Higgins Way, Pacifica, CA 94044.

Table 1. Translation of Intel 8085 mnemonics to Zilog Z80.

Intel 8085	Zilog Z80	Description	Intel 8085	Zilog Z80	Description
M	(HL)	Contents of HL register pair	JC nn	JP C,nn	Jump to nn if carry
ACI n	ADC A,n	Add n + carry bit to A	JM nn	JP M,nn	Jump to nn if minus
ADC r	ADC r	Add r + carry bit to A	JMP nn	JP M,nn	Jump to nn if minus
ADD r	ADD r	Add r to A	JNC nn	JP NC,nn	Jump to nn if no carry
ADI n	ADD A,n	Add n to A	JNZ nn	JP NZ,nn	Jump to nn if not zero
ANA r	AND r	Logical AND r & A	JP nn	JP nn	Jump to nn
ANI n	AND n	Logical AND n & A	JPE nn	JP PE,nn	Jump to nn if parity even
CALL nn	CALL nn	Call routine at nn	JPO nn	JP PO,n	Jump to nn if parity odd
CC	CALL C,nn	Call nn if carry bit set	JZ nn	JP Z,nn	Jump to nn if zero
CM	CALL M,nn	Call nn if minus	LDA nn	LD A,(nn)	Load A with contents of nn
CMA	CPL	Complement A	LDAX	LD A,(rr)	Load A with contents of register pair
CMC	CCF	Complement carry flag	LHLD nn	LD HL,(nn)	Load HL with data contained at address nn
CMP r	CP r	Compare r to A	LXI r,nn	LD rr,nn	Load register pair with nn
CNC nn	CALL NC,nn	Call nn if no carry	MOV r,r	LD r,r	Load register with contents of second register
CNZ nn	CALL NZ,nn	Call nn if not zero	MVI r,n	LD r,n	Load register with n
CP nn	CALL P,nn	Call nn if positive	NOP	NOP	No Operation
CPE nn	CALL PE,nn	Call nn if parity even	ORA r	OR r	Logical OR r with A
CPI n	CP n	Compare n to A	ORI n	OR n	Logical OR n with A
CPO nn	CALL PO,nn	Call nn if parity odd	OUT n	OUT n,A	Send byte in A out port n
CZ nn	CALL Z,nn	Call nn if zero	PCHL	JP (HL)	Jump to address in HL
DAA	DAA	Decimal adjust A	POP r	POP rr	Load register pair from stack
DAD r	ADD HL,rr	Add HL & register pair	PUSH r	PUSH rr	Put register pair on stack
DCR r	DEC r	Decrement register	RAL	RLA	Rotate A left with carry
DCX r	DEC rr	Decrement register pair	RAR	RRA	Rotate A right with carry
DI	DI	Disable interrupts	RC	RET C	Return if carry
EI	EI	Enable interrupts	RET	RET	Return
HLT	HALT	Stop processor	RIM	---	Load A with byte & read interrupt mask & serial port
IN n	IN n	Read byte from port n to A	RLC	RLCA	Copy A to carry, rotate left
INR r	INC r	Increment register			
INX r	INC rr	Increment register pair			

Table 1 continued

Table 1 continued

RM	RET M	Return if minus
RNC	RET NC	Return if no carry
RNZ	RET NZ	Return if not zero
RP	RET P	Return if positive
RPE	RET PE	Return if parity even
RPO	RET PO	Return if parity odd
RRC	RRCA	Copy A to carry, rotate right
RST	RST	Restart instruction
RZ	RET Z	Return if zero
SBB r	SBC A,r	Subtract r from A with carry
SBI n	SBC A,n	Subtract n from A with carry
SHLD nn	LD (nn),HL	Load HL to address nn
SIM	---	Set interrupt mask from A, read byte from serial port reset data bus
SPHL	LD SP,HL	Load stack pointer with HL
STA nn	LD (nn),A	Load address nn with A
STAX r	LD (rr),A	Load address pointed to by register pair with A
STC	SCF	Set carry flag
SUB r	SUB r	Subtract r from A
SUI n	SUB n	Subtract n from A
XCHG	EX DE,HL	Exchange DE & HL registers
XRA r	XOR r	Logical exclusive OR, r & A
XRI n	XOR n	Logical exclusive OR, n & A
XTHL	EX (SP),HL	Exchange contents of stack pointer with HL

Program Listing 1. COM/CMD.

```

00100 ; COMXTXT/SOR COM/CMD
00110 ; A MODEL I DISK UTILITY
00120 ; FOR FILE TRANSFER BETWEEN
00130 ; THE MODEL I AND MODEL 100
00140 ; USING RS232 COMMUNICATION
00150 ; BY RONALD F. BALONIS 8/23/83
00160 ;
00170 ;
7000 00180 ORG 07000H
00190 ;
00200 ;----- PROGRAM PARAMETERS
00210 ; RS232 COM STATS
00220 ; 9600 BAUD, 8 BIT WORD,
00230 ; PARITY ENABLED,
00240 ; ONE STOP BIT
00250 ; XON/XOFF ON SEND TO
00260 ; MODEL 100 ONLY
00270 ; ON MODEL 100 USE COM
00280 ; STATS OF 88E1E
00290 ;
00300 ; TO OUTPUT A DISK FILE
00310 ; TYPE: COM O FILENAME
00320 ;
00330 ; TO INPUT A 100 FILE
00340 ; TYPE: COM I FILENAME
00350 ;
00360 BAUDS EQU 0EEH
00370 CONFG EQU 0E5H
00380 XON EQU 11H
00390 XOFF EQU 13H
00400 HIMEM EQU 404AH
00410 CMD EQU 4318H
00420 FUNCT EQU CMD+4
00430 FILE EQU CMD+6
00440 QUIT EQU 402DH
00450 DNIT EQU 4420H
00460 DOPEN EQU 4424H
00470 DREAD EQU 4436H
00480 DWRITE EQU 4439H
00490 DCLOSE EQU 4428H
00500 VIDEO EQU 33H
00510 ;----- RESET THE UART FIRST
7000 CDDB71 00520 START CALL RSRST

```

Listing 1 continued

100 Disks

by Ronald F. Balonis

The Model 100's tape file system is great, but this is 1984 and I prefer disk storage. So I wrote a program called COM/CMD (Program Listing 1) that allows easy file transfer between a Model I/III and the Model 100 and adds manual disk storage to your Model 100.

To use the utility, connect the machines' RS-232 ports with a null modem cable or directly to the Model I if the communications terminal (COM/TERM) switch is set to COM.

File Transfer

To transfer a file from the Model 100 to a Model I/III, get into DOS on the Model I/III, type COM I and the file name, and press the enter key. Then, on the Model 100, type SAVE "COM:88E1E and press the enter key.

After a time, depending on the file type and length, COM/CMD sends the file to the Model 100's RS-232 port and saves it to the Model I/III disk. When the READY prompt and cursors appear on both computers, the transfer is complete.

To transfer a file from the Model I/III to the Model 100, type LOAD "COM:88E1E on the Model 100 and press the

enter key. In DOS on the Model I/III, type COM 0 and the file name and press the enter key.

After a time, again depending on the file type and length, the program reads the disk file and sends it to the Model I/III's RS-232 port. When the READY prompt and cursors appear, the transfer is complete.

The Program

My program is a collection of familiar Model I Z80 routines (see Table 2 for Model III modifications). The program first reads the DOS command line to select input or output mode and for the file name. The program then reads the files, whether input or output, into memory storage and then outputs them according to the mode of operation. In sequence, the routines are: Disk In, Com Out, Com In, Disk Out, Error messages, and the software for the RS-232 port.

The RS-232 stats are set in the software. It ignores configuration switches and sets communications parameters at 9600 baud, 8-bit word length, even parity, 1 stop bit, and XON/XOFF enabled on send to the Model 100 only.

The XON/XOFF, which enables the Model 100 to turn the Model I/III data stream on and off, is necessary to the communication link. Otherwise, the Model 100's housekeeping routines would lose data.

To get a copy of my utility program running on your Model I/III, if you have a Z80 disk assembler, simply key in the source listing and compile it. I use the Misisys modified version of the Radio Shack Series I Editor Assembler—Cassette. Alternatively, key in the hex listing with Debug, then use the DOS Dump command to put a copy on disk. ■

Contact Ronald F. Balonis at 118 Rice St., Trucksville, PA 18708.

The Key Box

The programs in "100 Disks" require 8K RAM on the Model 100, 32K RAM on a Model I or III. The programs in "Rooting Out the Problem" and "Autoliner" run in 8K RAM.

Listing 1 continued

```

7003 11E771 00530 LD DE,DCB
7006 211E43 00540 LD HL,FILE
7009 011700 00550 LD BC,23
700C EDB0 00560 LDIR
00570 ;----- SELECT COM <I>N OR COM <O>UT
700E 3A1C43 00580 LD A,(FUNCT)
7011 FE49 00590 CP 'I'
7013 287B 00600 JR Z,GETCOM
7015 FE4F 00610 CP 'O'
7017 C20071 00620 JP NZ,ERCMD
00630 ;----- PUT THE DISK FILE IN STORAGE
701A 11E771 00640 GETDSK LD DE,DCB
701D 010000 00650 LD BC,0000H
7020 C5 00660 PUSH BC
7021 210772 00670 LD HL,BUFFER
7024 CD2444 00680 CALL DOPEN
7027 C20571 00690 JP NZ,EROPEN
702A 110773 00700 LD DE,EROPEN
702D C1 00710 POP BC
702E C5 00720 READLP PUSH BC
702F D5 00730 PUSH DE
7030 11E771 00740 LD DE,DCB
7033 CD3644 00750 CALL DREAD
7036 FE1C 00760 CP 1CH
7038 281C 00770 JR Z,RCLOSE
703A FE1D 00780 CP 1DH
703C 2818 00790 JR Z,RCLOSE
703E B7 00800 OR A
703F C20A71 00810 JP NZ,ERREAD
7042 D1 00820 POP DE
7043 210772 00830 LD HL,BUFFER
7046 010001 00840 LD BC,256
7049 EDB0 00850 LDIR
704B C1 00860 POP BC
704C 0C 00870 INC C
704D 3A4A40 00880 LD A,(HIMEM)
7050 BA 00890 CP D
7051 CA2071 00900 JP Z,TOOBIG
7054 18D8 00910 READLP JR
7056 11E771 00920 RCLOSE LD DE,DCB
00930 ;----- PUT FILE LENGTH IN BC
7059 3AF371 00940 LD A,(DCB+12)
705C 47 00950 LD B,A
705D 3AEF71 00960 LD A,(DCB+8)
7060 4F 00970 LD C,A

```

```

7061 CD2844 00980 CALL DCLOSE
7064 C20A71 00990 JP NZ,ERREAD
01000 ;----- SEND FILE TO RS232 COM PORT
7067 210773 01010 PUTCOM LD HL,STORAG
706A CDCB71 01020 COMOUT CALL RSIN
706D FE13 01030 CP XOFF
706F 2007 01040 JR NZ,COMO
7071 CDCB71 01050 XXON CALL RSIN
7074 FE11 01060 CP XON
7076 20F9 01070 JR NZ,XXON
7078 7E 01080 COMO LD A,(HL)
7079 CDBE71 01090 CALL RSOUT
707C 23 01100 INC HL
707D 0B 01110 DEC BC
707E 79 01120 LD A,C
707F FE00 01130 CP 0
7081 20E7 01140 JR NZ,COMOUT
7083 78 01150 LD A,B
7084 FE01 01160 CP 1
7086 20E2 01170 JR NZ,COMOUT
7088 3E1A 01180 LD A,01AH
708A CDBE71 01190 CALL RSOUT
708D C32D40 01200 JP QUIT
01210 ;----- GET FILE FROM RS232 COM PORT
7090 CDF470 01220 GETCOM CALL READY
7093 010000 01230 LD BC,0000H
7096 210773 01240 LD HL,STORAG
7099 CDCB71 01250 COMIN CALL RSIN
709C B7 01260 OR A
709D 2002 01270 JR NZ,DATIN
709F 18F8 01280 JR COMIN
70A1 FE0A 01290 DATIN CP 0AH
70A3 28F4 01300 JR Z,COMIN
70A5 FE1A 01310 CP 01AH
70A7 2805 01320 JR Z,EOF
70A9 77 01330 LD (HL),A
70AA 23 01340 INC HL
70AB 03 01350 INC BC
70AC 18EB 01360 JR COMIN
70AE C5 01370 EOP PUSH BC
01380 ;----- PUT THE FILE ON THE DISK
70AF 11E771 01390 WDISK LD DE,DCB
70B2 210772 01400 LD HL,BUFFER
70B5 010000 01410 LD BC,0000H
70B8 CD2044 01420 CALL DINIT

```

Listing 1 continued

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Listing 1 continued

```

70BB C21571 01430 JP NZ,ERWRIT
70BE 210773 01440 LD HL,STORAG
70C1 C1 01450 POP BC
70C2 C5 01460 WRITLP PUSH BC
70C3 110772 01470 LD DE,BUFFER
70C6 010001 01480 LD BC,256
70C9 EDB0 01490 LDIR
70CB C1 01500 POP BC
70CC C5 01510 PUSH BC
70CD E5 01520 PUSH HL
70CE 210772 01530 LD HL,BUFFER
70D1 11E771 01540 LD DE,DCB
70D4 CD3944 01550 CALL DWRITE
70D7 B7 01560 OR A
70D8 C21571 01570 JP NZ,ERWRIT
70DB E1 01580 POP HL
70DC C1 01590 POP BC
70DD 05 01600 DEC B
70DE 78 01610 LD A,B
70DF FEFF 01620 CP 255
70E1 C2C270 01630 JP NZ,WRITLP
70E4 11E771 01640 WCLOSE LD DE,DCB
70E7 79 01650 LD A,C
70E8 32EF71 01660 LD (DCB+8).A
70EB CD2844 01670 CALL DCLOSE
70EE C21571 01680 JP NZ,ERWRIT
70F1 C32D40 01690 JP QUIT
01700 ;----- DISPLAY MESSAGES
70F4 21AF71 01710 READY LD HL,RDY
70F7 7E 01720 DSPLY LD A,(HL)
70F8 B7 01730 OR A
70F9 C8 01740 RET Z
70FA CD3300 01750 CALL VIDEO
70FD 23 01760 INC HL
70FE 18F7 01770 JR DSPLY
01780 ;
7100 213471 01790 ERCMD LD HL,ERR0
7103 1824 01800 JR DSPLY
7105 215071 01810 EROPEN LD HL,ERR1
7108 181F 01820 JR DSPLY
710A 11E771 01830 ERREAD LD DE,DCB
710D CD2844 01840 CALL DCLOSE
7110 216871 01850 LD HL,ERR2
7113 1814 01860 JR DSPLY
7115 11E771 01870 ERWRIT LD DE,DCB

```

```

7118 CD2844 01880 CALL DCLOSE
711B 217E71 01890 LD HL,ERR3
711E 1809 01900 JR DSPLY
7120 11E771 01910 TOOBIG LD DE,DCB
7123 CD2844 01920 CALL DCLOSE
7126 219971 01930 LD HL,TOBIG
7129 7E 01940 DISPLY LD A,(HL)
712A B7 01950 OR A
712B CA2D40 01960 JP Z,QUIT
712E CD3300 01970 CALL VIDEO
7131 23 01980 INC HL
7132 18F5 01990 JR DSPLY
02000 ;
7134 20 02010 ERR0 DEFM ' '
20 20 20 20
7139 2A 02020 DEFM '* COMMAND LINE ERROR *'
20 43 4F 4D 4D 41 4E 44
20 4C 49 4E 45 20 45 52
52 4F 52 20 2A
714F 00 02030 DEFB 0
7150 20 02040 ERR1 DEFM ' '
20 20 20 20
7155 2A 02050 DEFM '* FILE NOT FOUND *'
20 46 49 4C 45 20 4E 4F
54 20 46 4F 55 4E 44 20
2A
7167 00 02060 DEFB 0
7168 20 02070 ERR2 DEFM ' '
20 20 20 20
716D 2A 02080 DEFM '* SOURCE ERROR *'
20 53 4F 55 52 43 45 20
45 52 52 4F 52 20 2A
717D 00 02090 DEFB 0
717E 20 02100 ERR3 DEFM ' '
20 20 20 20
7183 2A 02110 DEFM '* DESTINATION ERROR *'
20 44 45 53 54 49 4E 41
54 49 4F 4E 20 45 52 52
4F 52 20 2A
7198 00 02120 DEFB 0
7199 20 02130 TOBIG DEFM ' '
20 20 20 20
719E 2A 02140 DEFM '* FILE TOO BIG *'
20 46 49 4C 45 20 54 4F
4F 20 42 49 47 20 2A

```

Listing 1 continued

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Listing 1 continued

```

71AE 00      02150      DEFB  0
71AF 20      02160 RDY   DEFM  ' '
20 20 20 20
71B4 2A      02170      DEFM  '* READY *'
20 52 45 41 44 59 20 2A

71BD 00      02180      DEFB  0
02190 ;
02200 ;----- THE RS232 COM PORT
00E8 02210 RESET EQU  0E8H
00E9 02220 CONFIG EQU  0E9H
00EA 02230 CONTRL EQU  0EAH
00EB 02240 DATA EQU  0EBH
02250 ;
71BE C5      02260 RSOUT PUSH BC
71BF 4F      02270 LD C,A
71C0 DBEA    02280 SENT IN A,(CONTRL)
71C2 CB77    02290 BIT 6,A
71C4 28FA    02300 JR Z,SENT
71C6 79      02310 LD A,C
71C7 D3EB    02320 OUT (DATA),A
71C9 C1      02330 POP BC
71CA C9      02340 RET
02350 ;
71CB DBEA    02360 RSIN IN A,(CONTRL)
71CD CB7F    02370 BIT 7,A
71CF 2808    02380 JR Z,NODATA
71D1 E638    02390 AND 38H
71D3 C20A71  02400 JP NZ,ERREAD
71D6 DBEB    02410 IN A,(DATA)
71D8 C9      02420 RET
71D9 AF      02430 NODATA XOR A
71DA C9      02440 RET
02450 ;
71DB D3E8    02460 RSRST OUT (RESET),A
71DD 3EE5    02470 LD A,CONFIG
71DF D3EA    02480 OUT (CONTRL),A
71E1 3EEE    02490 LD A,BAUDS
71E3 D3E9    02500 OUT (CONFIG),A
71E5 AF      02510 XOR A
71E6 C9      02520 RET
02530 ;
0020 02540 DCB DEFS 32
0100 02550 BUFFER DEFS 256
7307 02560 STORAG EQU S
7000 02570 END START
00000 TOTAL ERRORS

```

Changes

Line	Label	Source	Stmt
400	HIMEM	EQU	4412 hex
410	CMD	EQU	4225 hex

Additions

Line	Label	Source	Stmt
945		INC	A
1642		LD	A,(DCB + 12)
1644		DEC	A
1646		LD	(DCB + 12),A

Table 2. Model III modifications for disk storage program (COM/CD).

The Great Escape

by Scott Jones

Among the data omitted in the Model 100 user's manual are the escape codes, which control screen functions and cursor positioning. Though designed for use in the text editor, you can use the escape codes in Basic programs and with telecommunications (TELCOM) when transmitted from a host computer.

Using Escape Codes

To use an escape code in Basic, type

```
PRINT CHR$(27);"***";
```

replacing the asterisk with the letter in Table 3 after ESC, noting whether the letter is in upper- or lowercase.

To use an escape code in TELCOM, the host computer must first transmit an escape code (ASCII value of 27 decimal or 1B hexadecimal), then transmit the letter after ESC (see Table 3). The host computer should transmit the two characters together with no intervening space.

Special Instructions

Some of the codes in Table 3 require an explanation.

Use ESC T to set up the label line the Model 100 displays when you press the label key. ESC T protects the bottom line from scrolling and prevents the cursor from entering the bottom line. If the cursor is on the bottom line when you issue ESC T, it stays there until it's moved up or past the lower right position on the display.

ESC U unlocks the label line by allowing the cursor to move onto the last line; it does not clear the last line. If you press the label key and issue ESC U, you can print over the label line.

ESC V keeps the display from scrolling. When the cursor is in the lower right position and you've invoked ESC V, characters print over each other. ESC W allows scrolling to reoccur.

Use ESC Y to position the cursor. You must issue two characters after ESC Y: The first one determines the row; the second one, the column where the cursor goes. The cursor is positioned at the ASCII value of the characters minus 32. To move the cursor to row R and column C in Basic, type this command:

```
PRINT CHR$(27);"Y";CHR$(R + 32);CHR$(C + 32);
```

Note that column numbers begin with zero instead of 1. The upper left corner is Row 0, Column 0. This method may be more convenient than using the one value in a PRINT@ statement. ■

Contact Scott Jones at 3908 Stoney Ridge Trail, Charlotte, NC 28210.

Table 3. Escape codes.

Escape Code	Description
ESC A	Moves cursor up
ESC B	Moves cursor down
ESC C	Moves cursor to the right
ESC D	Moves cursor to the left
ESC E	Clears display and homes cursor
ESC H	Homes cursor (does not clear display)
ESC J	Clears from current position to end of display
ESC K	Clears from current position to end of line
ESC L	Inserts a blank line at the current line; moves text below cursor down a line
ESC M	Deletes the current line; moves text below cursor up a line
ESC P	Turns on flashing cursor
ESC Q	Turns off flashing cursor

Table 3 continued

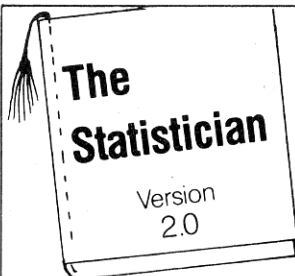
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Table 3 continued

ESC T	Protects bottom line from scrolling and overprint (used by label key)
ESC U	"Breaks through" label line
ESC V	Stops scrolling
ESC W	Starts scrolling
ESC Y X Z	Moves cursor to row X and column Z (ASCII character values minus 32)
ESC j	Clears display and homes cursor
ESC l	Clears entire current line
ESC p	Displays characters as white-on-black (inverse)
ESC q	Displays characters as black-on-white (normal)

Rooting Out the Problem

by William R. Harlow

Get to the roots of your math problems.

Two short programs for the Model 100, Plot (Program Listing 2) and Bisection (Program Listing 3), help you determine the root(s) of any given function.

Suppose you have an interval $I(a,b)$ and a variable V_{old} associated with it. The equation needed to transfer points to an interval $I'(c,d)$ with associated variable V_{new} is:

$$V_{new} = \frac{(d - c)V_{old} + (b*c - a*d)}{(b - a)}$$

The PSET command of the Model 100 allows 15,360 pixels. I decided to use a horizontal range of five to 235 units and a vertical range of three to 60 units. To establish the horizontal range, let XL and XR be the old values of X-to-the-left; X-to-the-right. Then XP equals $(230*X + 5*XR - 235*XL)/(XR - XL)$. Use a similar expression for the YP. The program tests whether it can plot the axes; then it plots the curve and PRINT@ puts the original ranges at the top of the plot. The program puts the function at line 140 in the form $Y = a$ function of X.

The program includes two examples. When you run the first, $Y = 4*\sin(3*X) - X^2 + 3$, it asks for XL and XR. I keyed in -4,4. The suggested increment becomes .08. I keyed in .1. Too large an increment spreads pixels out; too small an increment slows the plotting speed. Line 30 gives a reasonable value.

The program then asks for Y below and Y above. I keyed in -15,10. Now plotting takes place reasonably quickly. Line 200 is a loop; press the break key to get control back. A subroutine to select the smallest and largest Y value would add about five lines to the program. If the plot is poor, you can always try again with different values. You can also estimate roots by expanding the plot range.

The Bisection Program

The bisection method, one of the oldest known algorithms to determine a real root, isn't fast but it's fairly foolproof. If a function changes sign in an interval, there is at least one root in that interval and the bisection method will get it. Here is where the plot comes in handy: you can see places where roots occur or are close together and can use the appropriate values.

Line 300 is in the form $F =$ a function of X. Here I used $F = \log(X) - X^2 + 4$. X must be greater than zero. The plot revealed two roots: one close to zero and the other between

two and three. The program asks you to key in X left, X right, and epsilon. I keyed in .01, .2, $1E-8$. The program iterates, showing successive values. When $ABS(F)$ is less than epsilon, the program displays the root and functional values. You can then run the program for other possible roots.

To check your program, print out the two roots of the log function. The six roots of the trigonometry function displayed show how the plot helps you see close roots and how the bisection method determines them. ■

William R. Harlow has taught at the University of Cincinnati (the Department of Mechanical and Industrial Engineering, 836 Rhodes Hall, Cincinnati, OH 45221) since 1943.

```

10 CLS
20 INPUT"KEY IN X-LEFT, X-RIGHT ";XL,XR
30 PRINT"A SUGGESTED INCREMENT IS ";(XR-
  XL)/100
40 INPUT"KEY IN YOUR INCREMENT ";DX
50 INPUT"KEY IN YOUR Y-BELOW, Y-ABOVE
  ";YB,YA
60 CLS
70 YV=(60*YA-3*YB)/(YA-YB)
80 IF YV<3 OR YV>60 THEN 100
90 FOR H=5 TO 235:PSET(H,YV):NEXT H
100 XH=(5*XR-235*XL)/(XR-XL)
110 IF XH<5 OR XH>235 THEN 130
120 FOR V=3 TO 60:PSET(XH,V):NEXT V
130 FOR X=XL TO XR STEP DX
140 Y=4*SIN(3*X)-X^2+3
145 XP=(230*X+5*XR-235*XL)/(XR-XL)
150 YP=(60*YA-3*YB-57*Y)/(YA-YB)
160 IF YP<3 OR YP>60 THEN 180
170 PSET(XP,YP)
180 NEXT X
190 PRINTXL;"<x<";XR;TAB(27);YB;"<y>";YA

200 GOTO 200

```

Program Listing 2. Plot.

```

10CLS
20PRINT"          SOLUTION OF Y=F(X) BY
  BISECTION"
30INPUT"KEY IN X-LEFT,X-RIGHT,EPSILON
  ";L,R,E
40X=L:GOSUB 300:FL=F
50X=R:GOSUB 300:FR=F
60M=(L+R)/2:X=M:GOSUB 300:FM=F
70CLS:PRINT:PRINT:PRINT
80PRINTTAB(10)USING"ITERATE IS +
  #.###^";M
95IF ABS(FM)<E THEN 200
100IF FL*FM<0 THEN 120
110L=M:FL=FM:GOTO 60
120R=M:FR=FM:GOTO 60
200PRINT:PRINTUSING"          F(+
  #.#####^)=+#.##^";M,FM
210PRINT:END
300F=LOG(X)-X^2+4
310RETURN

```

Program Listing 3. Bisection.



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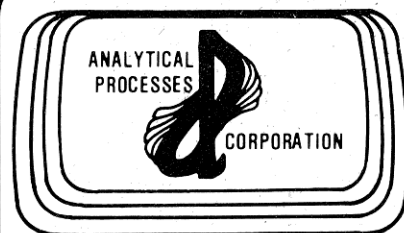
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C-Notes

Autoliner

by Richard Ramella

Autoliner (Program Listing 4) gives the Model 100 an automatic line-numbering capability similar to what Level II Basic provides.

The program lets you specify the starting line number of a program and the increment for each succeeding line. It is most useful when keying in published programs with regular line increments—100, 110, 120, and so on. Autoliner can also handle irregular line numbers—for instance, a line number of 237 in a program otherwise marked by lines in increments of 10.

Autoliner creates a text (.DO) file that becomes the program you key in.

Program Operation

First the prompt Name of Program ? appears. Name the program as you wish. If the name has more than six characters, the text file name becomes the first six characters in the name. This is required because a text file must be named in six or fewer characters.

The next prompt is Starting line number ? and may be any number from zero to 65,529, the highest line number the Model 100 accepts. Type the number and tap the enter key.

The final parameter-setting prompt is Line increment ? and

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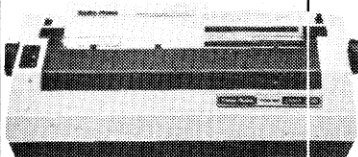


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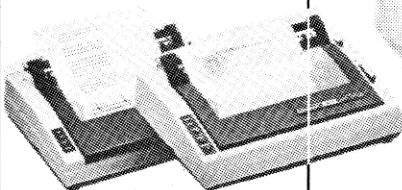


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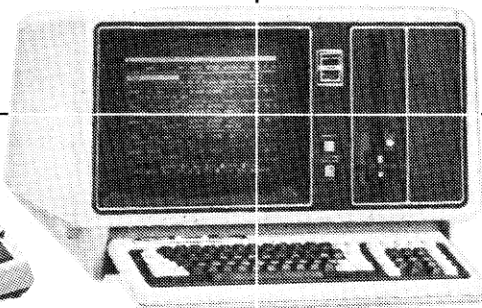


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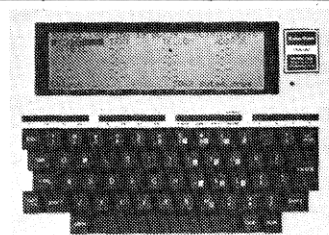
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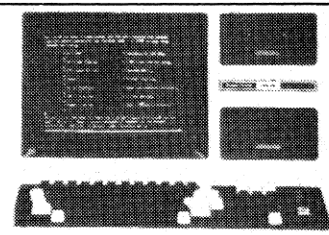
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may be any number from one up. Type the number and tap the enter key.

Now you're ready to key in the program. The prompts appear starting with the first line number and continuing in the increments you set.

An Example

Run the program Autoliner. Answer the first prompt by typing TEST and tapping the enter key. Answer the second prompt by typing 100 and hitting the enter key. Answer the third prompt by typing 10 and pressing the enter key. Line 100 appears with a prompt; answer it REM TEST and tap the enter key. Answer the line 110 prompt by typing PRINT "IT WORKS!" and hitting the enter key. Answer the line 120 prompt by typing ! and pressing the enter key. Answering any line prompt with an ! ends the program.

As it stops, the program announces See TEST.DO for program. TEST is the name of the program you have keyed in.

Then type RUN "TEST" and the program creates and runs a Basic version of the text file. Break into this new program and type SAVE "TEST" and tap the enter key. This puts the program in a Basic (.BA) file where it will be safe. Then type KILL "TEST.DO" and tap enter. This kills the unneeded text (.DO) version of the program.

Don't attempt to run your new program until you have completely keyed it in. It doesn't exist as a Basic program until

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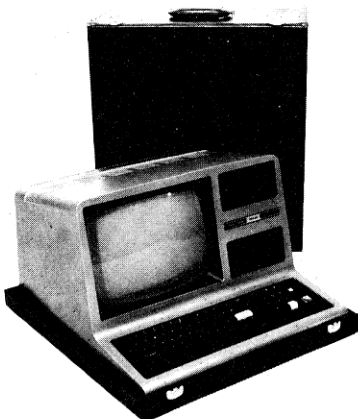
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you end things by typing ! and tapping the enter key.

If you find an irregular number in the listing, answer the line prompt with an asterisk and the program responds New line number and data ?. Answer this by typing the irregular line number and the program information that accompanies it. Then tap the enter key, and the program returns to the regular line increments you specified.

To correct a line, answer a line prompt with the asterisk and then type in the line number you want corrected and the correct version of the line. While useful for short lines, the program doesn't allow the full-screen text editing available when you've turned your program into a Basic file. You can put the same line number twice into a text file, but when you run it as a Basic program, it eliminates the old line and uses the new one.

A few lines at the start serve no purpose other than goof-proofing the program. If your starting line number is 65,000 or more, the program tells you the number of lines with which you have to work. If the increment you choose allows 150 or fewer lines for the program, Autoliner tells you that number. ■

Richard Ramella can be reached at 1493 Mt. View Ave., Chico, CA 95926.

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```

100 REM * Autoliner * TRS-80 Model 100
8K / Richard Ramella
110 CLS
120 MAXFILES=1
130 CLEAR 500
140 DEFSTR A
150 INPUT "Name of Program";L$
160 C=ASC(LEFT$(L$,1))
170 IF C>96 THEN C=C-32: L$=CHR$(C)+
RIGHT$(L$,LEN(L$)-1)
180 IF L$="" THEN GOSUB 420: GOTO 150
190 M$=LEFT$(L$,1)
200 IF ASC(M$)<65 OR ASC(M$)>90 THEN
GOSUB 420: GOTO 150
210 IF LEN(L$)>6 THEN Z$=LEFT$(L$,6)
ELSE Z$=L$
220 OPEN Z$ FOR OUTPUT AS 1
230 CLS
240 INPUT "Starting line number";B
250 B=INT(B)
260 IF B<0 THEN CLS: GOSUB 420: GOTO 240

270 IF B=>65000 THEN PRINT "The Model
100 allows line numbers up to 65529. You
have"65529-B"lines with which to": PRINT
"work.": GOSUB 570
280 CLS
290 INPUT "Line increment";D
300 F=INT((65529-B)/D)
310 IF F<150 THEN PRINT "You
have"F"lines with which to work.":
GOSUB 570
320 CLS
330 PRINT B;
340 LINEINPUT A
350 IF A="!" THEN 530
360 IF A="*" THEN PRINT "New line number
and data": INPUT A: PRINT #1,A: GOTO 330

370 A=STR$(B)+A
380 PRINT #1,A
390 A=""
400 B=B+D
410 GOTO 330
420 PRINT "Impossible. Please try again"

430 GOSUB 500
440 FOR T=1 TO 5
450 BEEP
460 NEXT
470 GOSUB 500
480 CLS
490 RETURN
500 FOR T=1 TO 500
510 NEXT
520 RETURN
530 CLS
540 PRINT "See "Z$".DO for program"
550 PRINT L$
560 END
570 PRINT
580 INPUT "Tap a key to continue";G
590 CLS
600 RETURN
610 END

```

Program Listing 4. Autoliner.

RAM FILES

Disassembler Debug

Several errors appeared in my Disassembler program (September 1983, p. 283) that make it run improperly. The following is a list of corrections:

RCLA in line 20 should be RLCA.

Lines 160 and 170 are the same in the listing. Line 160 should read:

```
160 DATA "LD L,D","LD L,E","LD
L,H","LD L,L","LD
L,(HL)","LD L,A","LD (HL),B"
```

Don't forget that tabs, not spaces, separate the mnemonics and operands.

Line 170 is missing a right parenthesis. "LD (HL,H" should read "LD(HL),H".

Lines 1760 and 1770 should end in RETURN:ELSE RETURN.

Finally, the two spaces in line 10530 in Fig. 1 should be carets for exponentiation (press the shift/6 keys).

I also have a few changes in the mnemonics. When I wrote the program I used Z80 code, but no relative jumps or alternate register sets exist in the 8085. You should make EX AF,AF' and EXX undefined. Leave EX DE,HL, and EX (SP),HL as they are.

All but two JR...@ (including DJNZ @) should be changed to undefined. JR NZ,@ should be RIM and JR NC,@ should be SIM. RIM is the read interrupt mask, and SIM is the set interrupt mask.

I put the equivalent restart commands for the Z80 and the 8085 in Table 1. Their functions are identical.

*David A. Cloutier
Bullard Road
North Brookfield, MA 01535
CIS #75705,730*

CR Patch

Most printers have a switch labeled "Auto LF after CR." Most computers (e.g., the IBM PC) require this switch to be off to distinguish between a line feed (LF) and a carriage return (CR).

TRS-80 computers require this switch be on so when

the computer sends a carriage return, the printer supplies the implied line feed.

If you use two different computers with the same printer, this protocol can be a hassle. We wrote the patch in Program Listing 1 to eliminate this problem.

Model 100 document files have CR/LF pairs embedded in them (try using control/P, control/M, control/P, control/J in Text), but the printer driver strips out any line feed immediately following a carriage return. This patch intercepts the printer driver between each character so it never knows that it just printed a carriage return.

We offer this patch with some trepidation, since it redirects a system jump vector into user memory. It presents no problems under most circumstances, but if you leave it switched on and load a program that clears memory above 62700 decimal, the results are unpredictable, and probably disastrous if you try to print anything.

The programs from the Portable Computer Support Group (PCSG) are an exception to the above caveat. They are fully compatible with this patch, even though they reserve memory above 62700.

*Michael Stanford &
Robi Robinson
Portable Computer Support Group
11035 Harry Hines #207
Dallas, TX 75229
Support Hotline: 214-351-0564*

Built-in Criticism

Publicity for the Model 100 always emphasizes the five built-in programs, including the editing program, Text; the scheduler program, Schedl; and the address organizer, Addrss.

Schedl and Addrss consist of nothing but the search and find parts of Text, with the rest of the text modification capabilities turned off so you can't accidentally clobber any of your address or schedule information. This is OK, but it's more like one and a half programs than three.

In addition, Addrss only operates on the ADRS.DO file, and Schedl can only operate on the NOTE.DO file. This is quite inconsistent.

Next time around, Tandy should combine Schedl and Ad-

Z80	8085
RST 00H	RST 0
RST 08H	RST 1
RST 10H	RST 2
RST 18H	RST 3
RST 20H	RST 4
RST 28H	RST 5
RST 30H	RST 6
RST 38H	RST 7

Table 1. Restart commands for the Z80 and the 8085.

```
0 ' Program CRLFIX V1.0 830827
10 ON KEY GOSUB 20,30:KEY ON
12 CLS:PRINT@130,"PCSG Line Feed Patch";:P
RINT@281,"On Off";
14 GOTO 14
15 DATA 245,58,172,250,254,13,194,48,245,6
2,10,50,172,250,241,201
20 CLEAR 256,62700:FOR I!=62754 TO 62769:
READ A:POKE I!,A:NEXT
25 POKE 64228,34 :POKE 64229,245: MENU
30 POKE 64228,243:POKE 64229,127: MENU
```

Program Listing 1. Patch to insert a line feed after a carriage return.

RAM FILES

drss into a single program that operates on any Model 100 file. You can then keep and search multiple lists of data, addresses, jobs, and so on.

A.E. Siegman
Edward L. Ginzton Laboratory
Stanford University
Stanford, CA 94315

Bar Graph Program

I am looking for a bar graph program for the Model 100 that either produces printable data from the program from "The Year in Review" (August 1983, p. 207) or from another program containing a hard copy print routine.

The program must work on my A.M.P. 120 printer.

T. Hardy McCoy
7718 D.S. Victor
Tulsa, OK 74136

Cram Notes

Brad Dixon's Cram 100 program (October 1983, p. 283) is a barrel of fun.

He mentions sound capabilities, so I changed lines 100 and 130 to values other than 2216 for variety. In line 200 I put SOUND0,2: between BEEP: and NEXT.

The best change is to put Avg in addition to Turns and High at the top of the screen. Add $G=G+1$ to line 40, $TT=TT+N$ to line 200 (before CLS), and add $AV=TT/G$. I'm looking forward to the expansion of C•Notes.

David Dunn Thomas
2308 Chetwood Circle #103
Timonium, MD 21093

Screen RAM Location

While stepping through the Model 100's RAM (24K), I found that the screen RAM is located at 65024 to 65343, inclusive, for a total of 320 bytes.

While I can't POKE characters on the screen, I can PEEK them. Even stranger, the information POKEd to the screen is in RAM, but is not on the screen! I have displayed the keyboard matrix setup in Table 2.

I use Program Listing 2 to PEEK about in RAM. The commands are:

- CTRL to enter a new address.
- SHIFT to add one to the address.
- GRPH to subtract one from the address.

The program displays both the decimal value and the ASCII value if it is printable. The best feature of this program is that it constantly updates information on the screen.

I hope the readers of 80 Micro can make use of this information.

Joseph Gaudreau
314 E. Main St.
Malone, NY 12953

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Value found when PEEKing matrix:								
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65425	Z	X	C	V	B	N	M	L
65426	A	S	D	F	G	H	J	K
65427	Q	W	E	R	T	Y	U	I
65428	O	P	BRKT	::	" "	<	>	?
65429	1	2	3	4	5	6	7	8
65430	9	0	—	+	=	LA	RA	UA DA
65431	SPC	DEL	TAB	ESC	PASTE	LABEL	PRINT	ENTER
65432	F1	F2	F3	F4	F5	F6	F7	F8
65433	SHIFT	CTRL	GRPH	CODE	NUM	CAPS	????	BREAK

Table 2. Keyboard matrix setup for the Model 100.

```
100 ' "RAMER.BA" - A RAM SCANNER
110 PRINT:PRINT:INPUT"Start @;A:CLS
120 PRINT@,A;:FORP=0TO6
130 PRINT@+4*P,PEEK(A+P);" ";
150 IFPEEK(A+P)>32THEN PRINT @9+4*P,CHR$(PEEK(A+P));
ELSE PRINT @9+4*P," ";
160 NEXT
170 C=PEEK(65433):IFC=0THEN120
180 IFC=1THENA=A+1
190 IFC=2THEN110
200 IFC=4THENA=A-1
500 GOTO 120
```

Program Listing 2. RAM screen POKE for the Model 100.

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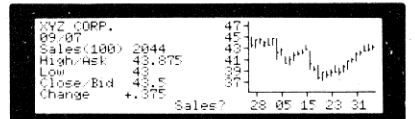


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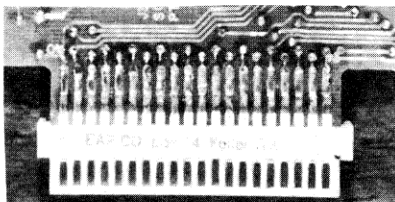
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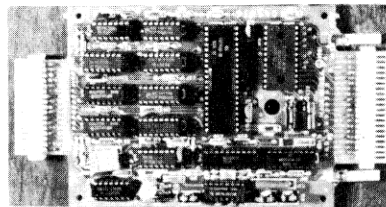
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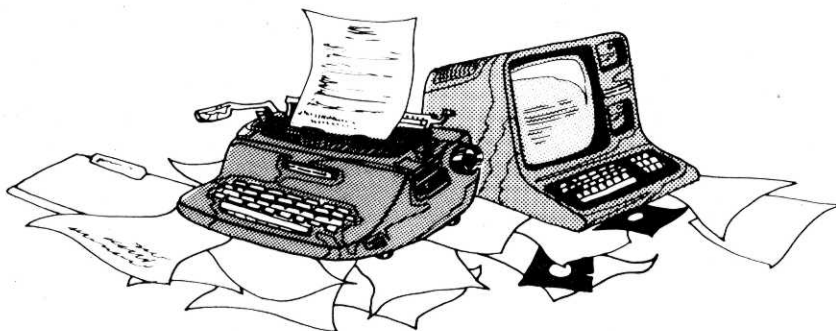
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NEWS THIS MONTH



From House to school

Micros in class: will Congress foot the bill?

Even before Rep. Pete Stark presented his "Apple bill" to Congress in 1982 (see *80 Micro*, May 1983, p. 340), micros were pouring into America's schools. Now seven other proposals, including one from Radio Shack sponsored by House Majority Leader Jim Wright, have increased the pressure to make computers a classroom prerequisite.

Stark's original bill, which would have encouraged computer makers to donate micros to schools and take the machines' value as a tax write-off, passed the House last year by a 323-62 vote. It stalled in the Senate, amid charges it was mainly a boost for Apple—which was poised to contribute \$200 million worth of IIe's, reaping not only the tax break but an enormous market among school officials buying replacements and parents buying computers to use at home.

The California Democrat has reintroduced the "Apple bill," essentially unchanged, as H.R. 701 in the current session. In the meantime, however, Majority Leader Wright has introduced H.R. 2417—which might, considering its technical specifications and Wright's Texas constituency, be described as "the Tandy bill."

While its overall concept is similar to Stark's, H.R. 2417 has several vital differences. One requires that dealers give teachers eight hours of training on donated equipment, this training to take place within "the immediate vicinity of the participating teacher's school." While mileage has not been specified, the training requirement favors Radio Shack, whose 6,500-plus outlets far outnumber Apple or other brands' dealers.



TRSDOS to go: Tandy's new transportable.

The Model 4P

The Model III mode's on a disk instead of in ROM, but the slogan is terrific: Radio Shack's TRS-80 Model 4P, "a microcomputer worth carrying about," reached dealers on Nov. 15. The transportable version of the 64K Model 4 weighs 26 pounds and costs \$1,799.

The 4P's white case contains a 9-inch screen, two slimline 184K disk drives, and a detachable keyboard (with all 70 Model 4 keys, including Control, Caps Lock, and three function keys). Like its deskbound cousin, the 4P offers both a 64-column Model III mode and an 80-column by 24-line display for TRSDOS 6.0

programs, as well as compatibility with Tandy's long-delayed CP/M Plus.

Memory is expandable to 128K. A \$149.95 modem board offers direct-connect 300-baud communications; Radio Shack describes the board as "user installable," which—considering Tandy's famous void-warranty warning against opening a TRS-80's case—is as revolutionary a development as the 4P itself.

The transportable's \$1,799 price is \$200 under the 12-inch-screened Model 4's; with the demise of the Osborne 1, the 4P's closest competitor seems to be another 64K Z80 suitcase, the Kaypro II. The Kaypro currently sells for \$1,595, with 10 CP/M applications programs included. ■

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Wright's bill also outlines hardware standards, recommending a system with two 184K disk drives. To skeptics, this translates as "a TRS-80 Model 4"; the system Apple has been giving to California schools includes one 140K drive.

Finally, Wright appeals to legislators' thrift: Apple's plan lets manufacturers write off 200 percent of the hardware's "basis cost" (a bit more than production cost), while Tandy would settle for 125 percent and throw in software equal to 10 percent of the machines' value.

Naturally, the two manufacturers disagree on the bills' pros and cons. Stephen Scheier, director of Apple's Kids Can't Wait program (now distributing micros to California schools), told *InfoWorld's* Scott Mace that the Radio Shack bill "would limit the number of computers we or other manufacturers can offer."

Tandy's director of corporate planning, George Kuhnreich, countered by criticizing Apple's lack of training requirements: "You can't just dump the CPU on someone's desk."

Both the Stark and Wright proposals are currently stalled in committee.

A Full House

Meanwhile, six other computer bills are now crowding Capitol Hill. Rep. Tim Wirth (D-Colorado) would let schools choose their micros as independent shoppers rather than giveaway recipients, with government subsidies for purchase of systems, software, and peripherals. Wirth also advocates training facilities similar to those created by the Defense Education Act after the USSR launched Sputnik in 1957.

His bill, H.R. 3750, attracted 40 cosponsors in its debut before the Labor Day recess, despite an estimated cost of up to \$200 million for each of 10 years.

Rep. Tom Downey (D-New York) has introduced legislation to create computer education and information centers, which would provide some software in addition to teacher training and demonstration facilities.

Finally, Mace writes, Rep. Brian Donnelly (D-Massachusetts) grants the same 200 percent deduction as Stark, but his bill requires companies to make 75 percent of their donations to "schools with students whose parents' incomes are below the national median."

In the Senate, John Danforth's S.

1194, written by the American Electronics Association, has attracted endorsements from the National Association of Secondary School Principals and the National Committee on Industrial Innovation. The Missouri Democrat's bill, which would cost some \$300 million, encourages teacher training and educational research and development, as well as supplying tax breaks for the donation of hardware and software.

Sen. Lloyd Bentsen (D-Texas) has introduced a similar bill. Along with his Apple proposal, Stark has put a

bill identical to Danforth's before the House.

Though S. 1194 has strong support in the Senate, as do Stark, Wright, and Wirth in the House, no single plan seems likely to break out of committee before the others. With legislators torn between election-year economy and rising demand for better education, an alliance between schools, micro manufacturers, and the federal government—an idea reportedly born in early 1982, when Stark met Apple Chairman Steve Jobs on a cross-country plane trip—may be ready to graduate. ■

HARDWARE

Remember PMC?

From Model I clones to CP/M boxes.

With the IBM PC inspiring a dozen imitators and the Apple/Franklin copyright lawsuit making headlines (see *80 Micro*, December 1983, p. 258), it's easy to forget that the first microcomputer work-alike was based on Radio Shack's trusty Model I. Today, Personal Micro Computers Inc. is phasing out its Tandy twin in favor of an 8-pound box that gives CP/M power to mainframe terminals—and PMC's president is optimistic that the corporate market will bring better sales than did their TRS-80 copies.

"We're pioneers in the clone field," President Ron Troxell told *80 Micro*. Originally a vendor of printers and peripherals, the Mountain View, CA, firm made its systems debut in 1980 with the \$495 PMC-80, a beige-cased micro with 16K RAM, Level II Basic in ROM, CRT interface, and built-in high-speed cassette deck.

A year later, the PMC-81 appeared: the same machine, with upper- and lower-case standard and a numeric keypad replacing the tape deck, for \$595. Users could upgrade both machines to 48K with a PMC expansion interface, and run all Model I software.

PMC sold its micros through mail order and a small group of about 60 dealers. They didn't sell very many. Datapro Research Corp. of Delran, NJ, estimates that 35,000 of the Model I compatibles are in operation; Troxell, while claiming "that's probably low,"

won't give an official figure.

Is PMC still making 80s and 81s? As of September 13, Troxell indicated the work-alikes aren't long for this world: "Yes, we are [selling them]. We've also introduced a new computer which will take the place of that product."

That may be a little misleading; the new PMC-101 MicroMate is not a personal computer, but a Z80A-based unit with 128K RAM, one 400K disk drive, RS-232 and Centronics ports, and no monitor or keyboard. It operates with any asynchronous terminal, turning a mainframe outlet into a workstation for CP/M Plus software.

"We have targeted the market very accurately on this product to the installed terminal base existent in large corporations and government agencies, where these agencies are looking to add local computing power to their existing mainframe operations," Troxell said.

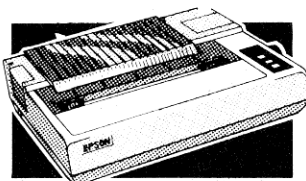
"They can switch between dumb terminal operation and intelligent workstation operation, where they can do local word processing and spreadsheet, things like that, or any other CP/M program off-line from the mainframe, and also upload information to and from the mainframe.

"There's also a very strong OEM market for this particular product because it's nice packaging," he continued. "It's a simple little thing that provides a lot of computing power at a small price [\$1,195]."

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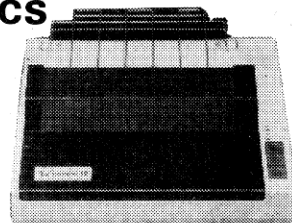
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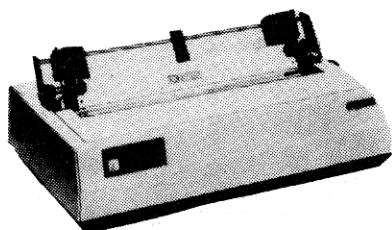
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The old: PMC's EPS-80 word processor.

Considering that corporations are rushing to complete office automation systems from makers like IBM and DEC—and that demand today is for 16-bit rather than 8-bit machines—the MicroMate might be considered an underdog. Nevertheless, Troxell anticipates success when his distributors' salespeople call on data processing managers.

"[The MicroMate] doesn't compete with [the big firms' products] at all," he said. "It really augments the systems that they're providing."

As for software, Troxell sees CP/M Plus (Digital Research's 3.0 version) and the PMC-101's price as offsetting any 16-bit advantages. "We were the first people on the market with a CP/M Plus system delivered," he claimed. "We've been very happy with it. It's a good [operating] system."

"The wealth of software that's available on CP/M right now makes this ap-

proach very reasonable, and something that other CP/M companies have bypassed. Nearly every other CP/M machine on the market is sold with a terminal and keyboard. So there's a huge market, my gosh, there're six million terminals out there."

As for the PMC-80 and -81, Troxell reassures owners, "We'll continue to support the product, provide service and so forth, here. And we're still involved in selling peripherals, printers,

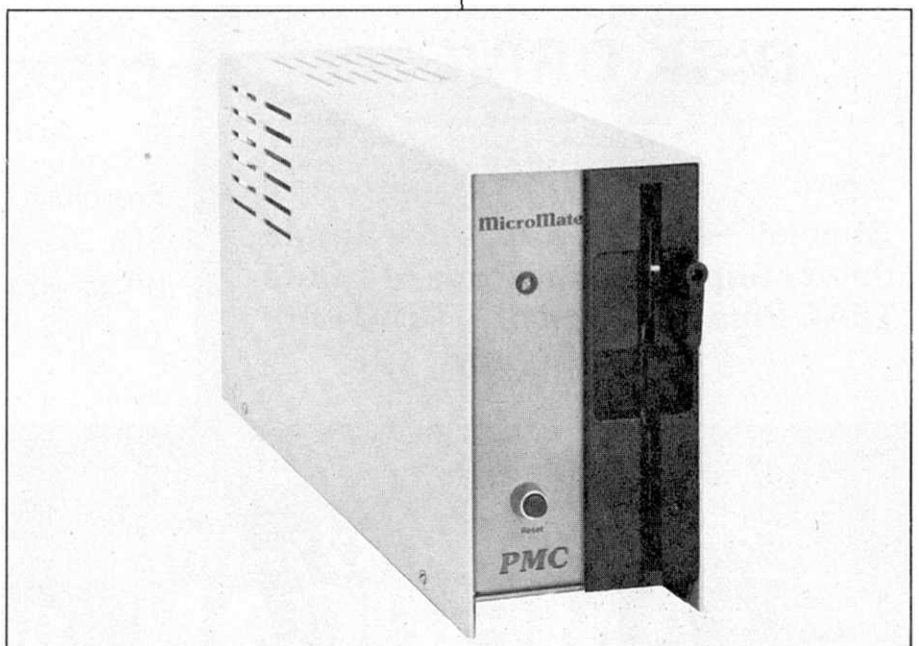
"We're pioneers in the clone field."

disk drives, that sort of thing." In addition, PMC's EPS-80 word processor, a 48K model with both Basic and Electric Pencil in ROM, will be sold at least a while longer at \$795.

Looking to the future, Troxell said, "We're in very good shape. The MicroMate's going to make a very significant impact on PMC sales; as the MicroMate picks up we'll probably phase the others out completely as we expect the MicroMate to be a very good seller."

Beyond that? "All I can say is that the logical direction for everybody is toward 16-bit systems, but it's not practical for us at this time." ■

—E.G.



The new: PMC's MicroMate for CP/M.

UPDATE

The Model I: Staying alive

Vendors vow continued support.

Nothing lasts forever, and three years is forever in the computer industry. Nevertheless, the TRS-80 Model I—the first mass-marketed personal computer—is hanging in there nearly seven years after its introduction, defying both old age and its replacement by newer Radio Shack micros. Perhaps 250,000 of the 300,000 Model I's sold are still in service—and, judging from an unofficial survey, some vendors think the I will survive for some time to come.

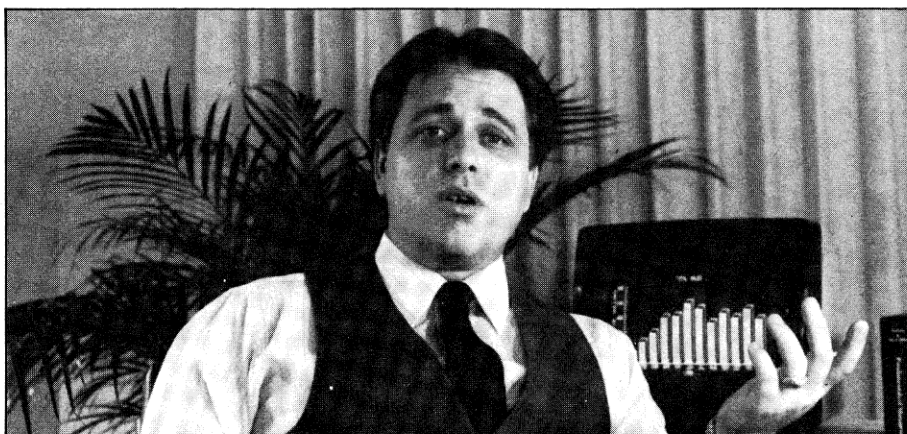
The survey, conducted by questionnaire to 69 TRS-80 hardware and software manufacturers and distributors, yielded 18 opinions of the Model I marketplace. A solid majority of respondents described the I as “still viable” for hardware and software sales (57 and 73 percent respectively), and a quarter of them said their business had increased in the past year.

Among hardware vendors, 28 percent said the Model I market was up, 43 percent said it was unchanged, and 28 percent admitted business was down. Model I software seems less popular, with figures of 27 percent (up), 27 percent (unchanged), and 36 percent (down).

The Model I has always attracted hardware buyers, since it's a system designed to be upgraded. Many of today's vendors began as frustrated hackers selling their own solutions to Model I problems—clock speed-up kits, disk storage doublers, gold-plated replacements for unreliable connectors, and so on.

When the Model III appeared in 1980, fixing many of the I's limitations but lacking complete compatibility, Radio Shack's move forward—plus the I's expandable, modular design—opened the door to outside initiative. In a sense, Tandy taught the Model I to fly by pushing it out of the nest.

Is it still flying? Questionnaire responses fell roughly into three categories, describing the Model I in negative, neutral, and positive terms—or, to pick



Swaim: New life for “a dead horse.”

distinctive adjectives, obsolete, adequate, and wonderful.

On the negative side, George Blank of New Classics Software said, “[The Model I] is unreliable and getting more so as time goes on.” In addition to “not reliable,” Eugene Shklyar of XYZT Computer Dimensions Inc. mentioned “slow processor,” “limited memory,” and “not produced any more,” and Arlene Schaffer of Taranto & Associates Inc. said, “Too many problems, too slow, not enough capacity.”

On the other hand, Logical Systems Inc.'s J. Kyle DiPietropaolo pointed out, “The fact that new computers exist doesn't make [the Model I] any less useful for doing the things it is capable of.” Several vendors echoed John Monin of Alpha Products Co., who said the I “does the basic job once the bugs are fixed.”

And some are loyal fans, who see the Model I as a workhorse that still works for technically astute or upgrade-conscious owners. George Geczy of JMG Software International wrote, “Compared to my Model I, the Apple IIe is not so hot.” United Software Associates' John Burgan added, “My Model I does everything my Model III can three times faster [with a speedup mod].”

Rather than comparing the I to younger machines, Theresa Welsh of AlphaBit Communications Inc. summed up TRS-80 pioneers' situation pragmatically: “Our customers like it. Their only worry is lack of service, parts, and software. People will keep their Model I's as long as there's support for it.”

As for that, the prospects aren't all bad. Fifty-seven percent of the hardware vendors claimed their firms had new Model I products coming, as did 55 percent of software respondents.

To companies not already involved, LNW Research Corp.'s Jim Swaim admitted that the Model I has “basically been abandoned in the marketplace. It's simply a dead horse.” For current supporters, though, “the Model I can become a very viable marketing area for someone with a product that makes sense, at a price the user can live with.”

Besides, Swaim added, “The mentality of people who own Model I's is superior from an electronics standpoint, and of course their dedication to the machine is almost legendary.” Age may not count for much in the computer industry, but 250,000 owners pack some clout. ■

—Vester Scott

Apple sings the blues?

No one expects Apple Computer Inc. to go the way of Atari, TI, or Mattel, but there are some clouds over Cupertino, CA. Apple stock fell from last June's high of \$62 to \$24.25 a share by late September, and fourth-quarter profits were expected to total \$5 million to \$8 million, compared to \$18.7 million a year ago. Still worse, some industry analysts predict that up to 600 Apple employees might be laid off by Christmas.

The trouble, to put it briefly, was that the IIe and III were getting old, the McIntosh was still in the wings, and the Lisa was too expensive. Despite rave reviews for its integrated software, Apple's \$10,000 flagship has been trounced by the IBM PC in corporate sales—and industry analysts like Charles Newton of Newton-Evans Research Co. fear Apple has “too many eggs in its Lisa basket.”

One corporate move, though it scared Wall Street (sending Apple stock down eight points), made sense: a cut in Lisa prices, bringing the system to \$8,190. Apple also began selling an “empty” Lisa for \$6,995, offering its six programs (LisaWrite, Calc, Graph, Project, Draw, and List) individually or as a \$1,195 set.

As *InfoWorld* reported, this made it possible to buy a Lisa package for less than an IBM PC XT with VisiOn software. (The XT has 10 megabytes of hard disk storage to Lisa's five, but Lisa has 1 megabyte of RAM versus the IBM's 256K.)

Even so, buyers are hesitating to spend the money for



Lisa: Low in sales appeal.

Lisa, especially since rumors ever since its January 1983 introduction have promised a similar Apple at a fraction of the cost. The McIntosh, first described as a \$3,000 PC competitor, is now supposedly a \$1,200 rival to IBM's Peanut. January is expected to bring a Lisa-like upgrade for the Apple IIe, perhaps reviving sales of the antique machine.

And there are various rumors about the fate of the Apple III: disappearance (as Apple concentrates on the IIe, McIntosh, and Lisa for the low-, middle-, and high-end markets), a comeback sparked by a new business unit in Cupertino, or anything in between.

Most of all, Apple finds itself (in *Computerworld's* phrase) “swimming in a Big Blue sea.” A crucial part of Lisa's quest for corporate acceptance, the ability to link with IBM mainframes, was postponed when a widely reported deal with Cullinet Software Inc. collapsed, and the harsh realities of the software world have brought about the specter of Lisa owners junking their integrated programs and running MS-DOS with an 8086 card.

Marc Rudov of Venture

Development Corp., Wellesley, MA, and other analysts say that Apple, like Osborne, created a market and then fell behind its changes. As *CW's* Patricia Keefe reports, “Rudov recommended Apple abandon its ‘No. 1 strategy’ and start thinking of itself as ‘No. 2.’ ”

Modem technology patented

For most of 1983, industry watchers were saying that 1984 would be the year of the \$50 smart modem—that lower prices would spark the same boom in telecommunications that cheaper micros have brought to home computing. Now it looks like just the opposite may occur: A Sunnyvale, CA, firm has patented the technology used in many modems. If its claim is upheld, the company can command licensing fees from manufacturers, thereby driving retail prices up.

Michael Eaton, president of Bizcomp, told *InfoWorld* that he thought of the intelligent modem, which automatically switches between command and data status, in

1978. Bizcomp began selling a unit in March 1980, 14 months before Hayes Microcomputer Products introduced its popular Smartmodem.

Besides the Hayes unit, *IW's* John Markoff reports, “virtually all currently marketed personal computer modems that link to the serial interface,” as opposed to being bit-mapped directly to a bus, use Bizcomp's switching technique.

As a result, though the exact amount is a secret, Hayes “has signed a multimillion-dollar licensing agreement” for the use of “technologies...defined in the Bizcomp patent.” And Bizcomp intends to sign up other manufacturers.

“It's not our intent to drive anyone out of business,” Eaton said. “[However,] we expect a lot of reaction [from modem makers] when they realize their product line is subject to licensing.”

As for reaction from buyers, Eaton admits, “Costs will go up because of royalty payments to us.” Kenneth Bosomworth, president of International Resource Development Corp. of Norwalk, CT, calculated that Smartmodem prices would rise 3 to 5 percent.

Others disagree. Bert Weiss, national sales manager for Anchor Automation, predicted Bizcomp would have trouble enforcing its patent: “It's tough to patent a smart modem. I don't think we're using anyone else's designs.”

Bizcomp Marketing Director Bruce Miller, on the other hand, told Markoff that the company would pursue patent users: “If we are challenged, it's safe to say we'll take them to court.”

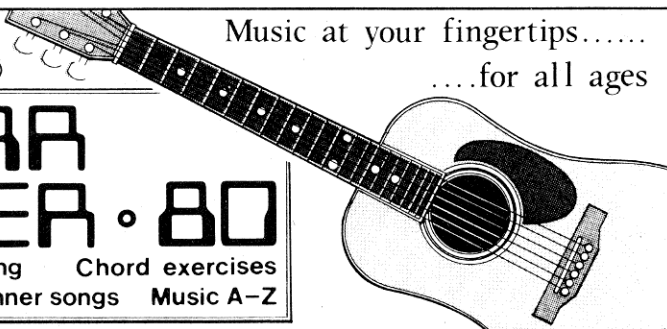
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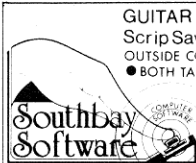


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make Bizcomp a household word. Hayes and Novation, according to Dan Foley of Dataquest in Cupertino, CA, control 70 percent of the personal computer modem market.

Nevertheless, Foley said, "I think the agreement is significant in the sense that it will provide Bizcomp with a great deal of capital." With the power of the patent, one of the Network Nation's major players may be behind the scenes.

The silicon college

Education via correspondence courses has been around almost as long as the mailbox, but the "electronic university" is an idea whose time has come. According to Ron Gordon, former chief executive officer of Atari Inc., his new venture, TeleLearning Systems Inc., will soon link as many as 5,000 teachers, half a million students, and micros in homes and offices across the U.S.

The San Francisco company plans to offer a 24-hour network giving students 170 courses, with hundreds more planned by late 1984. Its "knowledge module," a 300-baud modem, transfers

lectures, questions, answers, and homework assignments and exams, as well as giving students a high-resolution image of the professor on the other end of the wire.

The modem, the only way to access TeleLearning's network, is available for disk-equipped Apple IIs and IBM PCs (\$229.95) and Commodore 64s (\$129.95), with Radio Shack and Atari versions on the way. Tuition is \$35 to \$250 per course, for lessons ranging from college prep work to accounting and law.

TeleLearning's two selling points are ease of use—its software automatically handles log-on sequences and other protocols and verifies data transmission in both directions—and impressive academic credentials. Gordon promises that the American Medical Association plans to offer at least 100 courses, and "world-famous instructors" will be among those establishing on-line office hours in other subjects.

By "breaking down the barriers of time and distance," Gordon told *Computerworld*, his project will "bring education to millions and millions of people who are unable to have an education." In addition, TeleLearning is offering its software to corporations or existing

schools interested in setting up tutoring systems of their own.

The Reagan Administration likes the idea. U.S. Secretary of Education T.H. Bell attended TeleLearning's initial press conference in Washington, along with James Coyne, head of the White House Office of Private Sector Initiatives.

Said Coyne, "This is like the first day of school for a whole generation of Americans. It's a wonderful new beginning, and we at the White House wish it well and look forward to providing it with assistance."

Osborne U.K. to press on

Osborne Computer Corp. has filed for bankruptcy in California, but the micro may yet survive in Adam Osborne's native England. According to *MicroScope*, Osborne U.K. Managing Director Mike Healy hopes to set up production of the new Executive transportable and introduce the low-end Osborne that never made it to America.

"We have always traded on an arms-length basis with the U.S. manufacturer, and have always paid our way,"

Healy told the British bi-weekly. "We can get supplies of the [Executive], and we can continue trading."

While competition from Compaq and Kaypro is less severe in Britain and Australia, Healy admitted that "credibility is the problem" in keeping afloat as buyers watch his parent firm collapse.

"We have to take steps to protect our customers," he said. "In principle, we could have a 'Made in Britain' label on by February, and I think the Executive and the IBM-compatible Executive are competitive."

In addition, *MicroScope* says, Healy plans to sell the Vixen, the smaller, lighter replacement for the Osborne 1 that was rumored but never reached the U.S. market.

As for Adam Osborne, *MS* reports that the company founder was using idle post-bankruptcy hours to finish a novel, when not pointing out that his work with the Hayward, CA, firm had been primarily ceremonial since Robert Jaunich became president in January 1983.

Osborne has also been approached by science fiction writer and *Byte* columnist Jerry Pournelle, who's reportedly interested in writing a novel about the company's rise and fall. ■

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Comdex fever

● For some time, people have been saying that the biannual COMDEX shows are getting too big. The expos' sponsor, The Interface Group, has responded with more and bigger Comdexes: a third show on the West Coast, to be held each winter, will join the spring and fall events in 1984. Meanwhile, the Needham, MA, group has joined with the producers of the Consumer Electronics Show to finance a 120,000-square-foot addition to the Las Vegas Convention Center.

END BYTES

● The ADAM chronicles continue. In October, with FCC approval in hand and the \$600 system about to make its delayed debut, Coleco Industries execs were hit with a lawsuit from stockholders, claiming stock manipulation—selling shares in June, when Adam's announcement sent Coleco soaring, while concealing the real or rumored technical defects that surfaced later.

● Remember Cadillac's short-lived V-8-6-4 ENGINE, that ran on more or fewer cylinders depending on power demand? The latest trend in computing is multiple-personality micros. The Seequa Chameleon and Lanier's new Business Processor 1000 each have both Z80 and 8088 processors to run 8-bit CP/M and 16-bit MS-DOS software, and Micro Craft Corp.'s 8-, 16-, and 32-bit Dimension supports its own 68000 CPU and plug-in Z80, 8086, and 6502 cards.

● Half a dozen colleges assigned micros to incoming FRESHMEN last fall; Dallas Baptist College is the first to hand out Model 100s for in-class use. Each of DBC's 500 campus newcomers paid a computer-use fee of \$150 to \$300 to pick up a portable. After paying for four semesters, students will own their 100s, or can apply the fees toward purchase of a larger computer.

● In addition to challenging AT&T in long distance phone service, MCI Communications Corp. is moving into VIDEOTEX: For \$1, an MCI Mail subscriber with a micro and modem can call a local number and send a 7,500-character message to another subscriber anywhere in the U.S. If you're writing to someone who isn't on line, MCI will deliver a printout via the U.S. Postal Service for \$2 or Purolator Corp. for \$6.

● The forecasters at International Resource Development Inc. have given a morning line on the DOS WARS: CP/M-80, they say, will go from running on 58 percent of 1983's micros to 54 percent of 1986's, while MS-DOS' percentage climbs from 29 to 50 and Unix's from 2 to 10. AppleDOS will decline from 24 percent to 10 percent, and the big winners will be Smalltalk- or Lisa-style systems, with 0 percent today but 30 percent in 1986.

● Making the government-endorsed BBC micro has given ACORN 80 percent of the British educational market. The firm has launched a \$3 million ad campaign in hopes of placing its 64K, 6502-based machine in U.S. schools, but its chances seem dim: an Acorn costs \$995 with no monitor or disk drives.

● Speaking of dim, Acorn has proudly announced a new line of NON-SEXIST software, rightly declaring, "Britain is in danger of losing half its talent if girls don't acquire vital computer skills" and planning software that is "more relevant and useful to women." The first feminist release? A gardening program. ■



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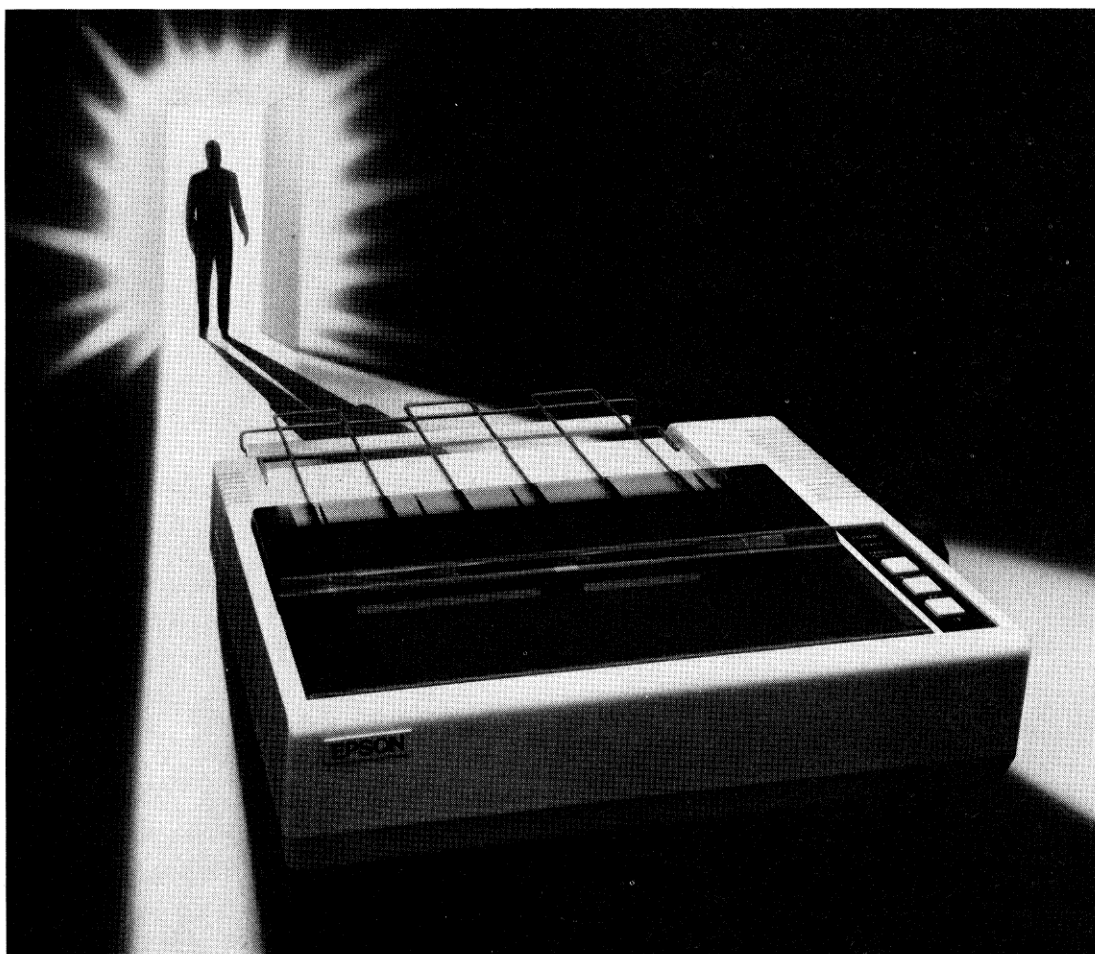
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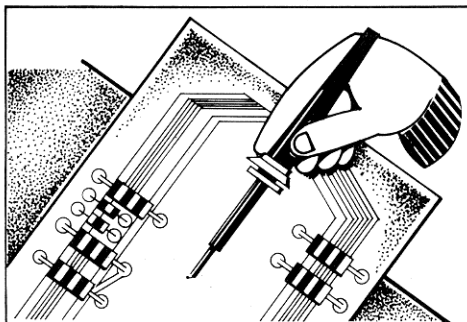
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Project 80, a regular column devoted to hardware projects, premieres in this issue. This month Roger Alford describes how to build a communications interface for your Model I or III.

—Eds.



Hardware that communicates

The ability to communicate with other computer systems and devices makes today's computers versatile. By using a standard interface on a TRS-80, for example, you can communicate with a mainframe computer system, transfer messages and files to and from other personal computers, send data to a printer, and control ongoing processes.

It's surprisingly simple and inexpensive to make such an interface using very large scale integration (VLSI) technology.

A variety of standard communications interfaces define the physical links whereby computers and other devices communicate. Included among these are: IEEE-488 (general purpose interface bus, or GPIB), RS-232C, RS-422, and the Hewlett-Packard interface loop

(HPIL) interfaces. To help complicate things, several standard communications protocols define the format of the communicated data, including asynchronous, binary synchronous (BISYNC), synchronous data link control (SDLC), and higher data link control (HDLC) protocols, among others. After carefully observing the computer industry—not only the communications aspect—I've concluded that there are too many stan-

dards, and too few "standard" standards.

For this project, I've chosen the popular RS-232C interface with the asynchronous protocol. The board I'll discuss contains two RS-232C ports with handshaking and individual baud rate selection, three input switches, three LEDs for output, a beeper and a 16-bit counter/timer. You can use the interface with a 16K Model I or III. The Program Listing lets you use the computer as a terminal with the RS-232C board.

RS-232C Principles

The RS-232C interface standard specifies a logical high in the $-3V$ to $-25V$ voltage range, and a logical low in the $+3V$ to $+25V$ range. Generally, devices using this interface use a DB-25 connector, either male (DB-25P) or female (DB-25S), for the physical interface. I've specified most of the pins on the DB-25 in the RS-232C standard (see Table 1), though in general they aren't all used in any given application. In fact in many, if not most, applications, you use only the ground, transmit, receive, and possibly a handshaking line (for example, clear to send/request to send).

Asynchronous Protocol Operation

Asynchronous communication, probably the most popular low-speed protocol, is quite simple in principle. While asynchronous communication is generally limited to a maximum rate of 19,200 baud (bits per second), the board I'll describe allows up to 38.4K baud.

Figure 1 shows the operation of the asynchronous protocol. Normally, when the computer isn't transmitting characters, the communication line is at a logical high state. When transmitting, the computer adds a start bit to the beginning of the character. The high-to-low transition that results indicates to the receiving device that a character is on the way.

The receiving device must have a clock available with a frequency that is an even multiple of the receive data's transmit rate. Typically, a frequency of 16 times (16X) the transmit rate is used. For example, if the incoming data is being sent at 300 baud, the receiving device will have a 4,800 Hz (300 times 16) clock available. For the remainder of

DB-25 Pin #	Mnemonic	Description
1	AA	Protective ground
2	BA	Transmitted data
3	BB	Received data
4	CA	Request to send
5	CB	Clear to send
6	CC	Data set ready
7	AB	Signal ground
8	CF	Received line signal detector
9	—	Reserved
10	—	Reserved
11	—	Unassigned
12	SCF	Sec. received line signal detector
13	SCB	Sec. clear to send
14	SBA	Sec. transmitted data
15	DB	Transmitted signal element timing (DCE)
16	SBB	Sec. received data
17	DD	Receiver signal element timing (DCE)
18	—	Unassigned
19	SCA	Sec. request to send
20	CD	Data terminal ready
21	CG	Signal quality detector
22	CE	Ring indicator
23	CH/CI	Data signal rate selector
24	DA	Transmitted signal element timing (DTE)
25	—	Unassigned

Table 1. RS-232C connector pin/function breakdown.

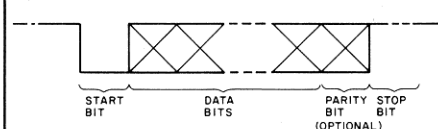


Figure 1. Asynchronous communication protocol format.

this discussion I'll assume a 16X clock frequency.

After the high-to-low transition from the incoming start bit, the receiver counts eight clocks (again, assuming a 16X clock) to find the middle of the start bit. It then checks to ensure that

the bit is still low; if it isn't, the receiver assumes line noise and resumes its search for a new start bit.

If the start bit verifies as a low level, the receiver counts 16 more clocks to find the middle of the first data bit (the low-order bit), and stores this bit value in its internal shift register. The receiver then continues to count 16 clocks and read in the data bits until all of them are in the shift register. It also reads in the optional parity bit, if specified.

After the receiver acquires all of these bits, it expects to see a stop bit, which is always a logical high. This helps verify

that it properly found the end of the character, and confirms that the line is high, allowing the next start bit to cause a high-to-low transition.

By reading each bit in the middle of the bit cell, the receiver allows for error between its own 16X clock frequency and the frequency of the transmitter's clock. Even if the frequencies are slightly off, the receiver should still read the correct bit values. The typical variation of transmitter/receiver clock frequencies generally keeps baud rates from exceeding the 19,200 baud mentioned above. At high frequencies even small differences between transmitter and receiver frequencies can cause problems.

You can use asynchronous protocol to send and receive a break—a logical low on the line for a period greater than one character time. Many systems use a break as an interrupt or as an abort.

The receiving device usually detects error types that occur during asynchronous communication, though the processor on the receiving end may ignore them. A parity error indicates that the parity of the received data was not what the receiver expected. A framing error indicates that a character was received without a valid stop bit. An overrun error indicates that a previously received character was not removed from the receiver's shift register before a new character started coming in, resulting in the loss of the former character.

UART Basics

A universal asynchronous receiver/transmitter (UART) is a device that operates with a processor over a parallel bus, but sends and receives data using the asynchronous format I've described. I use a dual UART (DUART) in this project since it has two independent asynchronous communication channels. The following discussion of UART basics also applies to the DUART.

Most UARTs allow for flexibility when setting up. By sending commands to the UART, the processor can usually specify the number of data bits to send and receive (generally between five and eight), the parity of transmitted and received data, or no parity, the number of stop bits on transmitted data, and often other characteristics.

The transmit section of the UART generally has two registers. The register most important for communication is the parallel load shift register; it adds

Quantity	Description	Manufacturer	Part Number
1	Prototype grid board	Radio Shack	276-158
2	20 pF capacitors		
1	Sonalert (see text)	Mallory	SC628
3	General-purpose red LEDs (D1-D3)		
3	270-ohm resistors		
3	4.7k-ohm resistors		
1	4-pin DIP switch	Radio Shack	275-1304
1	3.6864 MHz crystal	(see below)	
1	DUART (U1) (see below)	Signetics	SC2681AC1N40
2	1488 RS-232C drivers (U3, U5)		
2	1489A RS-232C drivers (U4, U6)		
1	1N914 general-purpose diode (D4)		
1	74LS04 hex inverter (U2)		
1	74LS32 quad two-input OR (U7—Model III only)		
1	40-pin cable header	3M	3432-4205
1	(50-pin for the Model III)	3M	3433-4205
2	Right angle PC mount DB-25S connectors (see text)	Winchester Electronics	47-1125S
1	4-pin power connector sockets for IC's (wirewrap or PC mount, as needed)		
1	40-pin card edge connector (for cable)	Radio Shack	276-1558
1	(50-pin for the Model III)	3M	3415-0001
1	40-pin socket connector	3M	3417-6000
1	(50-pin for the Model III)	3M	3425-6000
1	8-inch piece of 40-con- ductor ribbon cable		
1	(50-conductor for the Model III)		

The 2681 DUART with the 3.6864 MHz crystal, including a copy of the 2681 DUART data sheet and a cassette tape with the terminal routine object files for all common memory configurations, are available from the author for \$32 plus a \$1 shipping and handling fee. Michigan residents should add 4 percent sales tax. Winchester Electronics is located at Main St. and Hillside Ave., Oakville, CT 06779, (203) 274-9981.

Table 2. Dual RS-232C board parts list and ordering information.

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the start bit, specified parity, and stop bits to the data you're transmitting, and sends the resulting bit pattern out the UART transmit pin at the specified baud rate. The second register is the load register, which the processor loads with the transmit data. This data is transferred to the first register as soon as it's empty. Thus, up to two characters to be transmitted can exist in the UART at the same time. This dual transmit register structure allows maximum compaction of transmitted data, since the start bit of the character in the second register will immediately follow the last stop bit of the preceding character.

On most UARTs the receive section also has two registers whose purposes are similar to those in the transmit section. The computer shunts the incoming data into a shift register where it strips the start, stop, and parity bits. It then places the resulting character into the second buffer register, where it stores it while it transfers new data into the cleared shift register.

Since there are only two receive registers, the processor must be sure to read the characters from the UART before a new character comes into the shift register and destroys the previous character,

causing an overrun error. While in many applications this isn't a problem, since the processor can read the character in the buffer register while it moves the next character into the shift register, in some applications it is, at the very least, inconvenient.

Depending on how fast the data arrives and how much other work the processor has to do, it may not be able to get the data out of the UART in time to prevent problems. To help remedy this, many UARTs, including the Signetics 2681 DUART I'm using, have quad-buffered receivers, consisting of four registers instead of two, giving the processor more time to get the characters from the UART.

The Signetics 2681 DUART

The 2681 DUART from Signetics is a relatively new device that packs a lot of function into a 40-pin chip. The DUART has two independent asynchronous communication channels, an on-chip oscillator (requiring an external clock or crystal), separate internal baud rate generators for each channel, a 16-bit counter/timer, an 8-bit output port, and a 7-bit input port, as well as complete interrupt capability.

In my application I use four of the in-

put ports and output ports as RS-232C handshaking lines, leaving four spare outputs and three spare inputs. Three of the spare outputs drive LEDs you can use as status indicators; the fourth drives a beeper to indicate when the RS-232C has received an ASCII bell character. You connect the spare inputs to a DIP (dual in-line package) switch, which the processor then reads to specify certain set-up options.

The Dual RS-232C Board

The accompanying photo shows the prototype dual RS-232C board for the Model I. Though compact, it has many functions. All of the electronics, except for one inverter and the RS-232C interface chips, are on the 2681, so hook-up to the TRS-80 is simple and straightforward (see Fig. 2).

As drawn, the 2681 takes up the input/output (I/O) addressing locations 00-7F hexadecimal (hex), although the 2681 only uses 00-0F hex. If you have other peripherals in this I/O addressing range (the Radio Shack peripherals use higher addresses), you can decode the addressing to a narrower range as needed. I used the current configuration because it required the least amount of support circuitry—a necessary goal in

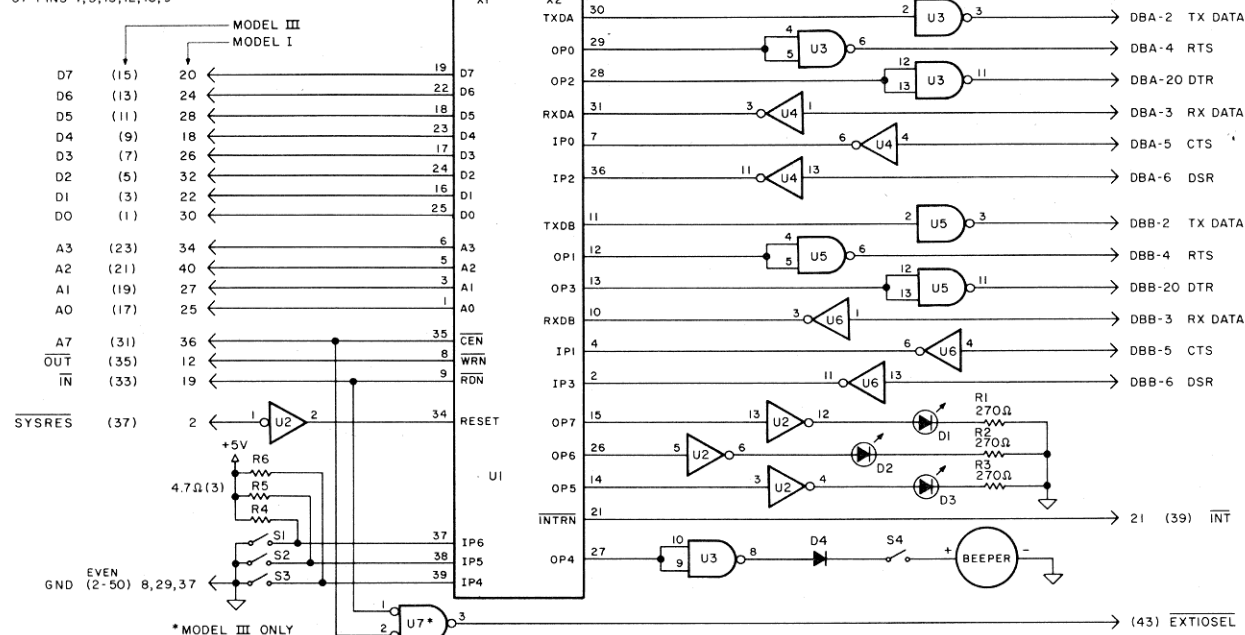
NOTE: THESE LINES SHOULD BE TIED TO GROUND:

U2-PINS 11, 9

U4, U6-PIN 10

U5-PINS 9, 10

*U7-PINS 4, 5, 13, 12, 10, 9



order to keep everything on such a small (2.75- by 3.75-inch) board.

The schematic (see Fig. 2) shows the connector pin numbers for the Model I as well as for the Model III (in parentheses). The Model III also requires one additional signal not necessary on the Model I. In both cases, you connect the interrupt line so that you can use the 2681 interrupts, or the processor can poll the DUART's status register to get the necessary status information. Make sure you know which pins on the board's connector correspond to which pins on the TRS-80 connector; the numbering can be confusing.

The parts list for the board (see Table 2) includes RS-232C connectors—DB-25S's (females), designed for printed circuit board mounting. In a pinch, you can use Radio Shack DB-25S connectors (part number 276-1548). The DUART is available through many electronics distributors, or you can purchase it from Washenaw Digital Systems (see Table 2).

The RS-232C standard specifies devices as either data terminal equipment (DTE) or data communication equipment (DCE), depending upon their function in a system or network. You wire the two types of devices as opposites, so that a one-to-one straight-through cable connects them properly for communication. For example, a DTE device transmits data on pin 2 and receives data on pin 3, while a DCE device transmits data on pin 3, and receives data on pin 2. The connections shown in the schematic (see Fig. 2) are for a DTE device (such as a standard terminal), allowing the board to connect straight through to a modem, for example.

The beeper I used on the prototype board is a Mallory Sonalert, but you can use any 12-volt beeper requiring a maximum of 8 milliamps.

It's interesting to see how much space you can save from older designs by using a new IC like the Signetics 2681. Motorola's board, which has two asynchronous communication channels, uses two 24-pin UARTs, a 24-pin baud rate generator, a large crystal, and a jumper matrix for baud rate selection, covering over 4 square inches of board space, and requiring a fair amount of interconnecting wiring. You can replace all of this with one 2681 DUART and a small crystal, while providing addition-

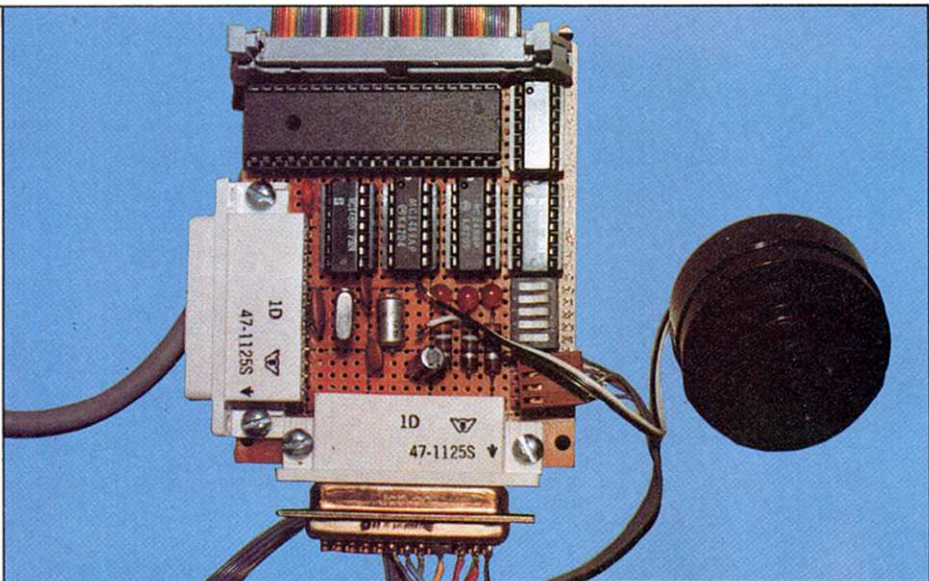


Photo. Prototype dual RS-232C board.

al I/O capability, greater interrupt flexibility, and a 16-bit timer/counter. The 2681 and its crystal require only 2.4 square inches—quite a savings!

Operation

Once you've constructed the board you'll need three power supplies: +5V (at 150 mA), +12V, and -12V. While lower voltages will suffice in place of the +/-12V supplies, I recommend the higher voltages, which allow greater communication distance.

Since timesharing on the personal computer has become so popular, I've used this function as the set-up example. The handshaking lines I've provided aren't necessary for this application; I've set the handshaking outputs active (low) in case the remote device is looking for an active signal.

Since there are two independent channels to choose from, you can use one as your terminal output, for example, and the other to communicate with

another device. For now, use channel A for the terminal output and set up channel B similarly.

My Assembly-language program (see Program Listing) is a complete terminal emulator for the Model I or the Model III (with slight modifications) with the dual RS-232C board, using channel A. The first part of the program refers to the set-up of the 2681.

The first byte the program sends to the 2681, 20 hex, goes to command register A (CRA) and resets the channel A receiver. The program then sends 30 hex to CRA to reset the channel A transmitter. A 40 hex byte sent to the CRA resets channel A error latches. The program sends these 3 set-up bytes only as precautions since a computer reset also performs these functions.

After the program sends the reset functions, it sets up the various communication parameters, including the number of data bits and stop bits, desired parity, if any, and the baud rate

Program Listing. Terminal Emulator.

```
00100 ;TRS-80 TERMINAL ROUTINE
00110 ;CREATED JUNE 25, 1983
00120 ;BY ROGER C. ALFORD
00130 ;LAST MODIFICATION: AUGUST 9, 1983
00140 ;
00150 ;This program allows the TRS-80 model I (or model III
00160 ;with indicated changes) to emulate a terminal, using
00170 ;the dual asynchronous board with the 2681 DUART. After
00180 ;initialization, the communication channel (channel A)
00190 ;is set for 9600 baud communication; this, however, can
00200 ;be changed as mentioned below.
00210 ;
00220 ;This program uses interrupts to receive characters,
00230 ;allowing communication speeds up to 19200 baud. When
00240 ;the computer is performing various functions -- such
```

Listing continued

Listing continued

```

00250 ;as screen scrolling or keyboard checking -- incoming
00260 ;characters are stored in a buffer in memory until they
00270 ;can be processed.
00280 ;
00290 ;The Shift/down-arrow combination acts as a Control key,
00300 ;allowing CTRL-B through CTRL-Y to be transmitted. The
00310 ;'BREAK' transmits a break for approximately 1/4 of a
00320 ;second. CTRL-A acts the same as pressing 'BREAK'.
00330 ;
00340 ;The 'CLEAR' key is used mostly as a user function key.
00350 ;By pressing it, followed by a numerical key, various
00360 ;functions can be implemented, as noted here:
00370 ;      1 = Enable printer to print incoming data.
00380 ;      2 = Disable printer from printing data.
00390 ;      3 = Select a new baud rate.
00400 ;      4 = Enable back-arrow as a 'DELETE' key.
00410 ;      5 = Enable back-arrow as a 'BACKSPACE' key.
00420 ;              (default)
00430 ;      6 = Send CTRL-Z.
00440 ;      0 = Return to the disk operating system.
00450 ;
00460 ;Model III users should include the lines that are
00470 ;originally inserted as comments, and include the words:
00480 ;'*** ADD LINE FOR MOD III'.
00490 ;
7000      00500      ORG      7000H
00510 ;
00520 ;DEFINE EQUATES:
FFFF      00530 TOPMEM EQU      0FFFFH ;TOP OF MEMORY
37E0      00540 INTCHK EQU      37E0H ;LOCATION TO CLEAR 25MS INT.
0006      00550 CTUR EQU      06H ;DUART UPPER COUNTER BYTF
0007      00560 CTLR EQU      07H ;DUART LOWER COUNTER BYTF
000A      00570 LF EQU      0AH ;ASCII LINEFEED
000D      00580 CR EQU      0DH ;ASCII RETURN
0008      00590 BS EQU      08H ;ASCII BACKSPACE
007F      00600 DELETE EQU      7FH ;ASCII DELETE
01C9      00610 TRSCLS EQU      01C9H ;SYSTEM CLEAR SCREEN ROUTINE
0020      00620 SPACE EQU      20H ;ASCII SPACE
0000      00630 MR1A EQU      00H ;DUART MODE REGISTER 1 CH A
0000      00640 MR2A EQU      00H ;DUART MODE REGISTER 2 CH A
0001      00650 CSRA EQU      01H ;DUART CLOCK SELECT REGISTER A
0002      00660 CRA EQU      02H ;DUART COMMAND REGISTER A
000F      00670 STPTMR EQU      0FH ;DUART STOP TIMER PORT (READ)
000E      00680 STTMR EQU      0EH ;DUART START TIMER PORT (READ)
0001      00690 SRA EQU      01H ;DUART STATUS REGISTER A
000D      00700 OPCR EQU      0DH ;DUART OUTPUT PORT CONFIG. REG.
000E      00710 SOPR EQU      0EH ;DUART OUTPUT PORT SET REGISTER
000D      00720 INP EQU      0DH ;DUART INPUT PORT
000F      00730 COPR EQU      0FH ;DUART OUTPUT PRT CLEAR REGISTER
0004      00740 ACR EQU      04H ;DUART AUX. CONTROL REG.
0005      00750 ISR EQU      05H ;DUART INTERRUPT STATUS REGISTER
0005      00760 IMR EQU      05H ;DUART INTERRUPT MASK REGISTER
0002      00770 TXBIT EQU      2 ;DUART SRA TX READY BIT
0000      00780 RXBIT EQU      0 ;DUART SRA RX READY BIT
0003      00790 TXDA EQU      03H ;DUART TX DATA REG. CH A
0003      00800 RXDA EQU      03H ;DUART RX DATA REG. CH A
4012      00810 INTLOC EQU      4012H ;TRS-80 INTERRUPT VECT. LOC.
4016      00820 KBDVEC EQU      4016H ;TRS-80 KEYBOARD VECTOR LOCATION
005F      00830 CRSCRH EQU      5FH ;CURSOR CHARACTER (UNDERLINE)
402D      00840 DOS EQU      402DH ;DOS ENTRY POINT
4026      00850 PRDRVR EQU      4026H ;PRINTER DRIVER ADDRESS LOCATION
03E8      00860 PRLN EQU      1000 ;PRINTER BUFFER LENGTH
37E8      00870 PROKFL EQU      37E8H ;PRINTER STATUS PORT
00880 ;
00890 ;INITIALIZATION:
7000 310000 00900 TERM LD SP,TOPMEM+1 ;SET STACK POINTER TO TOP
7003 F3 00910 DI ;DISABLE INTERRUPTS
00920 ; LD A,10H ;*** ADD LINE FOR MOD III
00930 ; OUT (0ECH),A ;*** ADD LINE FOR MOD III
7004 DB0F 00940 IN A,(STPTMR) ;STOP DUART TIMER
7006 AF 00950 XOR A ;CLEAR ACC.
7007 328274 00960 LD (TMRFLG),A ;CLEAR TIMER USE BYTF
700A 328474 00970 LD (CLRFLG),A ;CLEAR CLEAR FLAG
700D 328374 00980 LD (PRTFLG),A ;CLEAR PRINTER FLAG
7010 3E08 00990 LD A,BS ;GET ASCII BACKSPACE
7012 328574 01000 LD (BSDEL),A ;INIT BSDEL LOCATION
7015 3E20 01010 LD A,20H ;RESET DUART RECEIVER
7017 D302 01020 OUT (CRA),A ;RESET DUART TRANSMITTER
7019 3E30 01030 LD A,30H ;RESET ERROR LATCHES
701B D302 01040 OUT (CRA),A ;RESET ERROR LATCHES
701D 3E40 01050 LD A,40H ;RESET ERROR LATCHES
701F D302 01060 OUT (CRA),A ;RESET ERROR LATCHES
7021 3E13 01070 LD A,13H ;NO RX RTS, RX RDY INT
7023 D300 01080 OUT (MR1A),A ;NO PARITY, 8 BIT/CHR
7025 3E07 01090 LD A,07H ;NORMAL MODE, NO TX RTS
7027 D300 01100 OUT (MR2A),A ;NO CTS EN, 1 STOP BIT
7029 3E00 01110 LD A,0B0H ;BRG SELECT
702B D304 01120 OUT (ACR),A ;BAUD SELECTS
702D 3EBB 01130 LD A,0BBH ;9600 BAUD EACH
702F D301 01140 OUT (CSRA),A ;GET 9600 BAUD CODE
7031 3E06 01150 LD A,06H ;SAVE BAUD RATE CODE
7033 327774 01160 LD (BDRATE),A ;OUTPUT PORT DEFINITIONS
7036 3E00 01170 LD A,00H ;ALL 'OPR' OUTPUTS
7038 D30D 01180 OUT (OPCR),A ;GET OUTPUT BYTE
703A 3EEF 01190 LD A,0EFH ;TURN ON MOST OUTPUTS
703C D30E 01200 OUT (SOPR),A ;GET BEEPER PORT BIT
703E 3E10 01210 LD A,10H ;TURN BEEPER OFF
7040 D30F 01220 OUT (COPR),A ;GET INTERRUPT EN MASK
7042 3E0A 01230 LD A,0AH ;ENABLE RX AND CNTR INT
7044 D305 01240 OUT (IMR),A ;ENABLE TX AND RX
7046 3E05 01250 LD A,05H

```

Listing continued

for each direction; it must also specify the necessary interrupt information.

By sending 13 hex to mode register 1 A (MR1A), the program specifies no parity and 8 bits per character, which are standard for most terminals. Then the program sends 07 hex to the same register (now denoted MR2A), to set the transmitter for 1 stop bit; it also specifies that the RS-232C handshaking lines, connected to the DB-25S connectors, are not to be used.

The program initializes the baud rate at 9,600 baud by first sending 0B0 hex to the auxiliary control register (ACR) to indicate that the clock is from the crystal and the baud selection to be taken from set 2. Then it sends 0BB hex to the clock select register A (CSRA) to specify the particular baud rates. The transmitter and receiver can have different baud rates; each nibble of the CSRA byte specifies a different baud rate.

"It beeps whenever it receives a bell character."

The program follows this with a 00 hex to the output port configuration register to specify all of the output bits as general-purpose outputs, then turns on (low) all but one output by sending 0EF hex to the set output port register (SOPR). It sends the interrupt mask to its register (IMR), enabling the transmitter and receiver to begin operation.

Terminal Software Operation

Two of the program's lines depend on your system's configuration: line 530 specifies the top of memory, which changes depending upon the amount of memory in your system; line 500 specifies the starting address of the program, which can be a lower location if you're using a non-disk system.

When you start the program, it clears the screen and puts a sign-on message on the first line. It is initially set at 9,600 baud but you can change it from the keyboard. Several user commands, which make the program more versatile, were necessary to make up for the fact that I used the ROM keyboard encoder routine without a standard control key.

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All three output LEDs turn on after initialization, but the middle one toggles as the DUART receives characters. If you connect a beeper, enabled with the on-board DIP switch, it beeps whenever it receives a bell character (control/G). The break key sends a break for approximately one-quarter of a second.

The program uses the clear key as a user key. You must press this key, followed by a numerical key, to execute the desired function. Clear/1 enables the line printer, so that the program sends all incoming characters, except most control characters, to the printer. Clear/2 disables the printer so that the program sends it no more input characters.

Clear/3 lets you select a new baud rate. The program displays the current baud rate, along with the available baud options; you need merely press the key associated with the baud rate you want and the program displays the new baud rate.

Clear/4 lets you use the left-arrow key to delete instead of to backspace (it initializes as backspace). Clear/5 restores the backspace function.

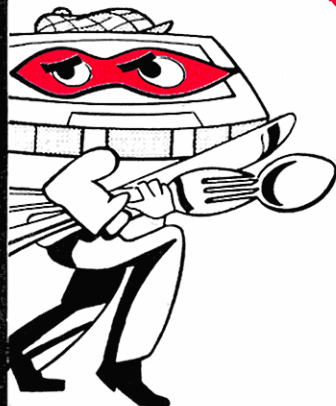
Though the simultaneous shift/down-arrow combination usually acts as a control key, a control/Z isn't easily decoded because of the nature of the keyboard decoding software. Consequently, clear/6 is set up to transmit control/Z—somewhat awkward, but it works.

Finally, clear/0 returns you to DOS (the disk operating system)—if you're using one; a DOS isn't necessary to run the terminal program.

The program uses interrupts to process incoming characters, which it places into a memory buffer until the computer can process them. Interrupts prevent the loss of incoming data when the Z80 is otherwise busy—during screen scrolling, for example. If fast data (that is, 4,800 baud or higher) is continually coming in while the screen has to keep scrolling, the full memory buffer can lose incoming characters. The program therefore uses as much of the available memory as possible. ■

Write to Roger C. Alford at Washenaw Digital Systems, P.O. Box 2014, Ann Arbor, MI 48106, or call him between 7 and 9 p.m. weeknights at 313-973-9763.

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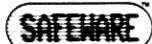
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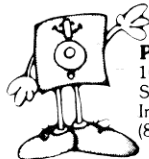
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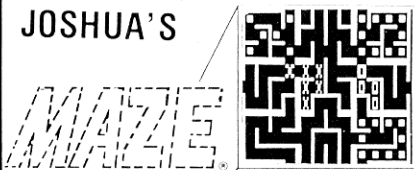
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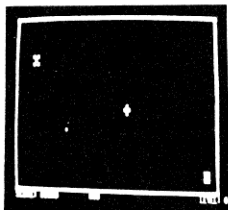


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PROJECT 80

Listing continued

711F CDD872	02260	CALL	SCREEN	;PRINT ON SCREEN
7122 C37A70	02270	JP	LOOP	;LOOP OVER
7125 FE34	02280	CP	'4'	;CHECK FOR NUMBER 4
7127 2008	02290	JR	NZ.CHK35	;IF NOT, CHECK NEXT
7129 3E7F	02300	LD	A,DELETE	;GET ASCII DELETE CHAR.
712B 328574	02310	LD	(BSDEL),A	;SAVE IN BCKSPC/DEL LOC.
712E C37A70	02320	JP	LOOP	;LOOP OVER
7131 FE35	02330	CP	'5'	;CHECK FOR NUMBER 5
7133 2008	02340	JR	NZ.CHK36	;IF NOT, CHECK NEXT
7135 3E08	02350	LD	A,BS	;GET ASCII BACKSPACE
7137 328574	02360	LD	(BSDEL),A	;SAVE IN BCKSPC/DEL LOC.
713A C37A70	02370	JP	LOOP	;LOOP OVER
713D FE36	02380	CP	'6'	;CHECK FOR NUMBER 6
713F 2004	02390	JR	NZ,CHK30	;IF NOT, CHECK NEXT
7141 3E1A	02400	LD	A,1AH	;GET CTRL-Z
7143 1831	02410	JR	NODOS	;SEND IT OUT
7145 FE30	02420	CP	'0'	;NUMBER 0?
7147 C27A70	02430	JP	NZ-LOOP	;IF NOT, LOOP OVER
714A AF	02440	XOR	A	;GET NEW IMR VALUE (0)
714B D305	02450	OUT	(IMR),A	;DISABLE DUART INTS
714D C0C901	02460	CALL	TRSCLS	;CLEAR SCREEN
7150 2A7E74	02470	LD	HT,(INTVEC)	;GET OLD INTERPRT VECT
7153 221340	02480	LD	(INTLOC+1),HL	;SAVE IN ORIGINAL PLACE
7156 C32D40	02490	JP	DOS	;RETURN TO DOS
7159 78	02500	LD	A,B	;RESTORE CHARACTER
715A FE08	02510	CP	BS	;BACKSPACE CHARACTER?
715C 2005	02520	JR	NZ.PROCED	;IF NOT, CONTINUE
715E 3A8574	02530	LD	A,(BSDEL)	;ELSE, GET PROPER CHAR.
7161 1813	02540	JR	NODOS	;SEND THE CHARACTER
7163 FE1A	02550	CP	1AH	;CTRL-Z?
7165 CA7A70	02560	JP	Z,LOOP	;IF YES, IGNORE
7168 FE01	02570	CP	01H	;BREAK?
			(CTRL-A)	
716A 280F	02580	JR	Z,BREAK	;IF YES, SEND BREAK
716C FE1F	02590	CP	1FH	;CLEAR KEY PRESSED?
716E 2006	02600	JR	NZ-NODOS	;IF NOT, SEND CHAR.
7170 328474	02610	LD	(CLRFLG),A	;SET CLEAR FLAG
7173 C37A70	02620	JP	LOOP	;LOOP OVER
7176 D303	02630	NODOS	OUT	(TXDA),A
7178 C37A70	02640	JP	LOOP	;LOOP AGAIN
717B F3	02650	DI		;DISABLE INTERRUPTS
717C 3E60	02660	LD	A,60H	;GET BREAK ON CMD
717E D302	02670	OUT	(CRA),A	;TURN ON BREAK
7180 3A8274	02680	LD	A,(TMRFLG)	;GET TIMER FLAG BYTE
7183 CB47	02690	BIT	0,A	;IS BEEPER USING IT?
7185 2809	02700	JR	Z,BROK	;IF NOT, SEND BREAK
7187 CBDF	02710	SET	3,A	;BREAK IS WAITING
7189 328274	02720	LD	(TMRFLG),A	;STORE NEW FLAG BYTE
718C FB	02730	EI		;RE-ENABLE INTERRUPTS
718D C37A70	02740	JP	LOOP	;LOOP AGAIN
7190 CBCF	02750	SET	1,A	;BREAK IS NOW USING
7192 328274	02760	LD	(TMRFLG),A	;SAVE NEW FLAG BYTE
7195 DB0F	02770	IN	A,(STPTMR)	;STOP THE TIMER
7197 FB	02780	EI		;ENABLE THE INTERRUPTS
7198 CD1F73	02790	CALL	TMRON	;TURN ON THE TIMER
719B C37A70	02800	JP	LOOP	;LOOP AGAIN
	02810			
719E F3	02820	DI		;DISABLE INTERRUPTS
719F 2A7C74	02830	LD	HT,(BCOUNT)	;GET BUFFER CHAR COUNT
71A2 7C	02840	LD	A,H	;GET UPPER BYTE
71A3 B5	02850	OR	L	;ZERO COUNT?
71A4 2002	02860	JR	NZ.GOTCHR	;IF NOT, GOT A CHAR
71A6 FB	02870	EI		;ELSE, ENABLE INTERRUPTS
71A7 C9	02880	RET		;DONE - RETURN
71A8 2B	02890	DEC	HI	;DECREMENT COUNT
71A9 227C74	02900	LD	(BCOUNT),HL	;STORE NEW COUNT VALUE
71AC 2A7874	02910	LD	HT,(BSTART)	;GET START POINTER
71AF 7E	02920	LD	A,(HL)	;GET BUFFER CHARACTER
71B0 CD0F72	02930	CALL	UPDATE	;UPDATE POINTER
71B3 227874	02940	LD	(BSTART),HL	;STORE NEW POINTER VALUE
71B6 FB	02950	EI		;ENABLE INTERRUPTS
71B7 47	02960	LD	B,A	;SAVE CHARACTER
71B8 3A8374	02970	LD	A,(PRTFLG)	;SET IF SHOULD PRINT
71BB B7	02980	OR	A	;SET FLAGS
71BC 78	02990	LD	A,B	;GET CHARACTER BACK
71BD C4C371	03000	CALL	NZ-PRBUFF	;IF NONZERO, PRINT IT
71C0 C3D872	03010	JP	SCREEN	;PRINT CHAR. AND RETURN
	03020			
	03030			
71C3 FE20	03040	CP	20H	;BUFFER CHARACTER FOR PRINTER SUBROUTINE:
71C5 3007	03050	JR	NC,PROK	;IS CHAR. ABOVE 19H?
71C7 FE0D	03060	CP	CR	;IF YES, CHAR. OK
71C9 2803	03070	JR	Z-PROK	;CARRIAGE RETURN?
71CB FE0C	03080	CP	0CH	;IF YES, OK
71CD C0	03090	RTN	NZ	;FORM FEED?
71CE 21E803	03100	LD	HT,PRLEN	;IF NOT, BAD CHAR.
71D1 ED5B8A74	03110	LD	DE,(PRCNT)	;GET PRINTER BUFFER LEN.
71D5 B7	03120	OR	A	;GET CURRENT BUFFER COUNT
71D6 ED52	03130	SBC	HT,DE	;CLEAR CARRY
71D8 C8	03140	RET	Z	;GET DIFFERENCE
71D9 13	03150	INC	DE	;IF NO ROOM - DONE
71DA ED538A74	03160	LD	(PRCNT),DE	;ELSE INCREMENT COUNT
71DE 2A8674	03170	LD	HT,(PRSTRT)	;SAVE NEW COUNT
71E1 77	03180	LD	(HL),A	;GET START BUFR PNTR
71E2 CD0172	03190	CALL	PRUPDT	;SAVE CHARACTER
71E5 228674	03200	LD	(PRSTRT),HL	;UPDATE POINTER
71E8 C9	03210	RET		;SAVE NEW POINTER VALUE
	03220			;DONE - RETURN
	03230			;CHECK FOR PRINTER BUFFER CHARACTER SUBROUTINE:

Listing continued

Listing continued

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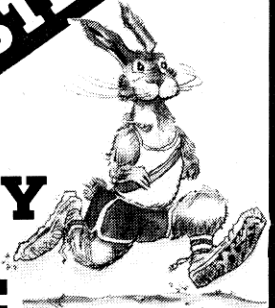
71E9 ED5B8A74 03240 PRCHK LD DE,(PRCNT) ;GET CURRENT PRBUFR COUNT
71ED 7A 03250 LD A,D ;CHECK FOR ZERO COUNT
71EE B3 03260 OR E ;ZERO?
71EF C8 03270 RFT Z ;IF YES, NO CHARS.
71F0 1B 03280 DEC DE ;ELSE, DECR. COUNT
71F1 ED538A74 03290 LD (PRCNT),DE ;SAVE NEW COUNT VALUE
71F5 2A8874 03300 LD HL,(PREND) ;GET END POINTER
71F8 7E 03310 LD A,(HL) ;GET CHARACTER
71F9 CD0172 03320 CALL PRUPDT ;UPDATE POINTER
71FC 228874 03330 LD (PREND),HL ;SAVE NEW END POINTER
71FF B7 03340 OR A ;CLEAR ZERO FLAG
7200 C9 03350 RET ;DONE - RETURN
03360 ;
03370 ;UPDATE PRINTER POINTER SUBROUTINE:
7201 23 03380 PRUPDT INC HL ;INCREMENT POINTER
7202 EB 03390 EX DE,HL ;PUT INTO DE REG. PAIR
7203 217478 03400 LD HL,PRBUFR+PRLEN ;GET END + 1
7206 B7 03410 OR A ;CLEAR CARRY
7207 ED52 03420 SBC HL,DE ;GET DIFFERENCE
7209 EB 03430 EX DE,HL ;PUT POINTER BACK INTO HL
720A C0 03440 RET NZ ;IF NOT SAME, VALUE OK
720B 218C74 03450 LD HL,PRBUFR ;ELSE, CHANGE POINTER
720E C9 03460 RET ;DONE - RETURN
03470 ;
03480 ;POINTER UPDATE SUBROUTINE:
720F 23 03490 UPDATE INC HL ;INCREMENT POINTER VALUE
7210 EB 03500 EX DE,HL ;PUT CURRENT PTR INTO DE
7211 21DFFF 03510 LD HL,BUFR+BUFLN ;POINT PAST END OF BUFFER
03520 ;
7214 B7 03530 OR A ;CLEAR CARRY FLAG
7215 ED52 03540 SBC HL,DE ;COMPARE DE AND HL
7217 EB 03550 EX DE,HL ;PUT CURRENT PTR IN HL
7218 C0 03560 RFT NZ ;IF NOT SAME, VALUE OK
7219 217478 03570 LD HL,BUFR ;ELSE, UPDATE POINTER
721C C9 03580 RET ;DONE - RETURN
03590 ;
03600 ;PRINT MESSAGE ON SCREEN ROUTINE:
721D 7E 03610 PRMSG LD A,(HL) ;GET CHARACTER
721E B7 03620 OR A ;ZERO CHARACTER?
721F C8 03630 RET Z ;IF YES, DONE
7220 E5 03640 PUSH HL ;ELSE, SAVE HL VALUE
7221 CDD872 03650 CALL SCRFEN ;PRINT CHAR. ON SCREEN
7224 E1 03660 POP HL ;RESTORE HL VALUE
7225 23 03670 INC HL ;POINT TO NEXT CHAR.
7226 18F5 03680 JR PRMSG ;LOOP UNTIL DONE
03690 ;
03700 ;PRINT BAUD RATE ROUTINE:
7228 3A7774 03710 PRBAUD LD A,(BDRATE) ;GET CURRENT BAUD BYTF
722B 215174 03720 LD HL,BDTBL2 ;POINT TO BAUD TABLE 2
722E B7 03730 OR A ;CHECK FOR ZERO BYTF
722F 2806 03740 JR Z,BDFND ;IF YES, BAUD=110
7231 47 03750 LD B,A ;SAVE BYTF IN COUNTER
7232 CD3B72 03760 FNDLP CALL FND00N ;POINT TO NEXT BAUD RATE
7235 10FB 03770 DJNZ FNDLP ;LOOP UNTIL CORRECT BD FND
7237 CD1D72 03780 BDFND CALL PRMSG ;PRINT BAUD ON SCREEN
723A C9 03790 RET ;DONE - RETURN
723B 7E 03800 FND00N LD A,(HL) ;GET CURRENT CHARACTER
723C 23 03810 INC HL ;POINT TO NEXT CHAR.
723D B7 03820 OR A ;ZERO CHARACTER?
723E C8 03830 RET Z ;IF YES, DONE
723F 18FA 03840 JR FND00N ;ELSE, CHECK NEXT CHAR.
03850 ;
03860 ;RECEIVE CHAR INTERRUPT SERVICE ROUTINE:
7241 D9 03870 RXISR EXX ;SAVE GP REGISTERS
7242 08 03880 IN AF,AF' ;SAVE ACC. AND FLAGS
7243 DB05 03890 IN A,(ISR) ;GET INT STATUS REG.
7245 E60A 03900 AND 0AH ;CHECK FOR DUART INT
7247 2006 03910 JR NZ,RXOK ;IF YES, PROCESS IT
7249 3AE037 03920 LD A,(INTCHK) ;ELSE, KILL TRS INT
724C C3D472 03930 JP RTADR ;DONE - RETURN FROM INT
724F CB5F 03940 BIT 3,A ;CHECK FOR COUNTER INT
7251 284A 03950 JR Z,RXOK2 ;IF NOT, CHECK RX INT
7253 DB0F 03960 IN A,(STPTMR) ;ELSE, STOP COUNTER
7255 3A8274 03970 LD A,(TMRFLG) ;GET TIMER FLAG BYTF
7258 CB47 03980 BIT 0,A ;CHECK FOR BEEPER USE
725A 2821 03990 JR Z,CHKB1 ;IF NOT, CHECK BREAK
725C 47 04000 LD B,A ;PUT FLAG BYTF INTO B REG
725D 3E10 04010 LD A,10H ;GET BELL BYTF
725F D30F 04020 OUT (COPR),A ;TURN BELL OFF
7261 78 04030 LD A,B ;GET FLAG BYTF
7262 CB87 04040 RFS 0,A ;CLEAR BELL USE BIT
7264 CB5F 04050 BIT 3,A ;BREAK WAITING?
7266 2810 04060 JR Z,NOBRWT ;IF NOT, DONE
7268 CB9F 04070 RES 3,A ;ELSE, WAIT NO LONGER
726A CBCE 04080 SET 1,A ;BREAK USE BIT SET
726C 328274 04090 LD (TMRFLG),A ;SAVE NEW FLAG BYTF
726F 3E60 04100 LD A,60H ;GET BREAK ON BYTF
7271 D302 04110 OUT (CRA),A ;START BREAK
7273 CD1F73 04120 CALL TMRON ;START TIMER
7276 185C 04130 JR RTADR ;DONE - RETURN FROM INT
7278 328274 04140 NOBRWT LD (TMRFLG),A ;SAVE NEW FLAG BYTF
727B 1857 04150 JR RTADR ;DONE - RETURN FROM INT
727D CB4F 04160 BIT 1,A ;BREAK USING SET?
727F 2853 04170 JR Z,RTADR ;IF NOT, DONE - OOPS!
7281 47 04180 LD B,A ;SAVE FLAG BYTF IN B REG
7282 3E70 04190 LD A,70H ;GET BREAK STOP CMD
7284 D302 04200 OUT (CRA),A ;STOP BREAK
7286 78 04210 LD A,B ;GET FLAG BYTF BACK
7287 CB8F 04220 RFS 1,A ;CLEAR BREAK USE BIT

```

Listing continued

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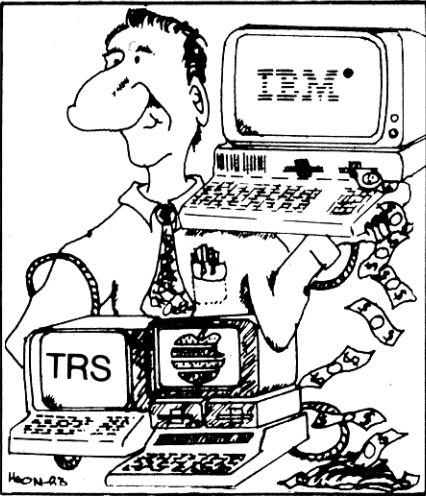
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PROJECT 80

Listing continued

7289 CB57	04230	BIT	2,A	;BEEPER WAITING?
728B 28EB	04240	JR	Z.NOBRWT	;IF NOT, DONE - RETURN
728D CB97	04250	RES	2,A	;NO LONGER WAITING!
728F CBC7	04260	SET	0,A	;BEEPER NOW USING
7291 328274	04270	LD	(TMRFLG),A	;SAVE NEW FLAG BYTE
7294 3E10	04280	LD	A,10H	;GET BEEPER MASK BYTE
7296 D30E	04290	OUT	(SOPR),A	;TURN ON BEEPER
7298 CD1F73	04300	CALL	TMRON	;TURN ON TIMER
729B 1837	04310	JR	RTADR	;DONE - RETURN FROM INT
729D DB01	04320	IN	A,(SRA)	;CHECK STATUS REGISTER
729F CB47	04330	BIT	RXBIT,A	;CHECK FOR RX CHAR INPUT
72A1 2831	04340	JR	Z.RTADR	;IF CLR, FALSE ALARM
72A3 DB0D	04350	IN	A,(INP)	;GET INPUT PORT BYTE
72A5 E640	04360	AND	40H	;CHECK BIT 6
72A7 2006	04370	JR	NZ.LEDON	;IF SET, LED IS ON
72A9 3E40	04380	LD	A,40H	;GET BIT 6 SET
72AB D30E	04390	OUT	(SOPR),A	;TURN ON LED
72AD 1802	04400	JR	CONTX	;CONTINUE BELOW
72AF D30F	04410	OUT	(COPR),A	;TURN OFF LED
72B1 ED5B7C74	04420	LD	DE,(BCOUNT)	;GET BUFFER COUNT
72B5 216B87	04430	LD	HI,BUFLEN	;GET LENGTH OF BUFFER
72B8 B7	04440	OR	A	;CLEAR CARRY FLAG
72B9 ED52	04450	SBC	HI,DE	;COMPARE VALUES
72BB 2B04	04460	JR	NZ.NRTADR	;IF SAME, IGNORE CHAR.
72BD DB03	04470	IN	A,(RXDA)	;GET CHARACTER - DISCARD
72BF 1813	04480	JR	RTADR	;QUIT
72C1 13	04490	INC	DE	;ELSE INCREMENT COUNT
72C2 ED537C74	04500	LD	(BCOUNT),DE	;STORE NEW COUNT VALUE
72C6 DB03	04510	IN	A,(RXDA)	;GET INPUT CHARACTER
72C8 E67F	04520	AND	7FH	;CLEAR UPPER BIT
72CA 2A7A74	04530	LD	HI,(BEND)	;GET BUF END POINTER
72CD 77	04540	LD	(HL),A	;STORE CHARACTER IN BUF
72CE CD0F72	04550	CALL	UPDATE	;UPDATE POINTER
72D1 227A74	04560	LD	(BEND),HL	;STORE NEW POINTER VALUE
72D4 08	04570	RTADR	EX	;RESTORE ACC. AND FLAGS
72D5 D9	04580	EXX		;RESTORE GP REGISTERS
72D6 FB	04590	EI		;RE-ENABLE INTERRUPTS
72D7 C9	04600	RET		;DONE - RETURN FROM ISR
72D8 FE0A	04610	;		
72DA C8	04620	SCRREN	CP	;CHECK FOR LINEFEED
72DB FE08	04630	RET	Z	;IF SO, IGNORE
72DD 2B14	04640	CP	BS	;CHECK FOR BACKSPACE
72DF 2A8074	04650	JR	NZ.NXT1	;IF NOT, GO ON
72E2 3E20	04660	LD	HL,(CURSOR)	;ELSE, GET CURSOR POS.
72E4 77	04670	LD	A,SPACE	;GET ASCII SPACE
72E5 2B	04680	LD	(HL),A	;REMOVE CURSOR ON CRT
72E6 7C	04690	DEC	HL	;DECREMENT CURSOR POINTER
72E7 FE3B	04700	LD	A,H	;GET HIGH PTR BYTE
72E9 2001	04710	CP	3BH	;SEE IF OFF SCREEN
72EB 23	04720	JR	NZ.FINE	;IF NOT, OK
72EC 3E5F	04730	INC	HI	;ELSE, INCREMENT POINTER
72EE 77	04740	LD	A,CRSCHR	;GET CURSOR
72EF 228074	04750	LD	(HL),A	;PUT ON CRT
72F2 C9	04760	LD	(CURSOR),HL	;SAVE NEW CURSOR POSITION
72F3 FE7F	04770	RET		;DONE - RETURN
72F5 2BE8	04780	CP	DELETE	;CHECK FOR DELETE
72F7 FE0C	04790	JR	Z.BS2	;IF YES, LIKE BACKSPACE
72F9 CA7173	04800	CP	0CH	;CHECK FOR CLS CHAR.
72FC FE07	04810	JP	Z.CLS	;IF YES, CLEAR SCREEN
72FE 202B	04820	CP	07H	;CHECK FOR BEL CHAR.
7300 F3	04830	JR	NZ.CHKRET	;IF NOT, CHECK FOR RETN
7301 3A8274	04840	DI		;DISABLE INTERRUPTS
7304 CB4F	04850	LD	A,(TMRFLG)	;GET TIMER FLAG BYTE
7306 2807	04860	BIT	1,A	;BREAK USING TIMER?
7308 CBD7	04870	JR	Z.NOBRK	;IF NOT, START BELL
730A 328274	04880	SET	2,A	;ELSE, BELL WAITING
730D FB	04890	LD	(TMRFLG),A	;STORE NEW FLAG BYTE
730E C9	04900	EI		;RE-ENABLE INTERRUPTS
730F CBC7	04910	RFT		;DONE - RETURN
7311 328274	04920	NOBRK	0,A	;BEEPER NOW USING TIMER
7314 DB0F	04930	LD	(TMRFLG),A	;SAVE NEW FLAG BYTE
7316 FB	04940	IN	A,(STPTMR)	;STOP THE TIMER
7317 3E10	04950	EI		;RE-ENABLE INTERRUPTS
7319 D30E	04960	LD	A,10H	;TURN ON BELL
731B CD1F73	04970	OUT	(SOPR),A	;SEND TO DUART OUT PORT
731E C9	04980	CALL	TMRON	;TURN ON TIMER
	04990	RET		;DONE - RETURN
731F 21FFFF	05000	;		
7322 7D	05010	TMRON	LD	HI,65535
7323 D307	05020	LD	A,L	;GET .28 SEC COUNTER COUNT
7325 7C	05030	OUT	(CTLR),A	;GET LOW BYTE
7326 D306	05040	LD	A,H	;WRITE LOW BYTE
7328 DB0E	05050	OUT	(CTUR),A	;GET HIGH BYTE
732A C9	05060	IN	A,(STTTMR)	;WRITE HIGH BYTE
732B FE0D	05070	RET		;START THE COUNTER
732D 280B	05080	CHKRET	CP	;DONE - RETURN
732F FE20	05090	JR	Z.PROCRT	;CHECK FOR RETURN
7331 D8	05100	CP	20H	;IF YES, PROCESS IT
7332 2A8074	05110	RET	C	;CHECK FOR INVALID CHAR.
7335 77	05120	LD	HL,(CURSOR)	;IF LESS, INVALID - RTN
7336 CD4873	05130	LD	(HL),A	;ELSE, GET CURSOR POS.
7339 C9	05140	CALL	UPDCRS	;STORE CHAR. ON CRT
733A 3E20	05150	RET		;UPDATE CURSOR
733C 2A8074	05160	PROCRT	LD	A,SPACE
733F 77	05170	LD	HI,(CURSOR)	;GET ASCII SPACE CHAR.
7340 7D	05180	LD	(HL),A	;GET CURSOR POS.
7341 F63F	05190	LD	A,L	;REMOVE CURSOR FROM CRT
7343 6F	05200	LD	A,L	;GET LOW CURSOR BYTE
	05210	OR	3FH	;GO TO END OF LINE
		LD	L,A	;PUT BACK INTO POINTER

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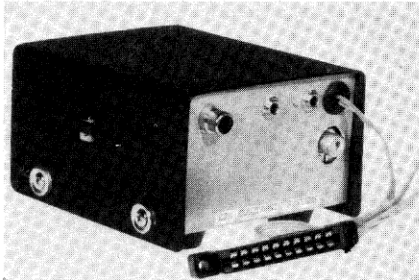
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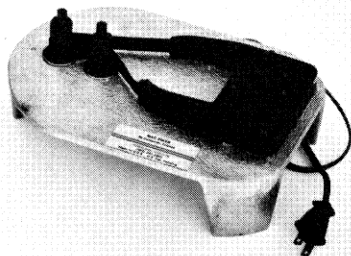
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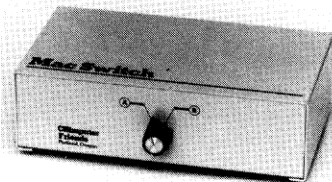
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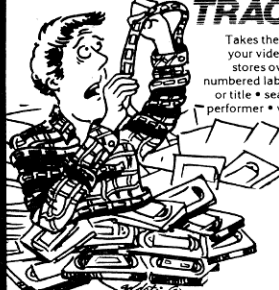
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PROJECT 80

Listing continued

```

7344 CD4873 05220 CALL UPDCRS ;UPDATE CURSOR
7347 C9 05230 RPT ;DONE - RETURN
7348 23 05240 INC HI. ;POINT TO NEXT DSP LOC.
7349 7C 05250 LD A,H ;GET HIGH PTR BYTF
734A FE40 05260 CP 40H ;OFF THE SCREEN?
734C 201C 05270 JR NZ,UPDN ;IF NOT, DONE
734E 11003C 05280 LD DE,3C00H ;ELSE, PREP. TO SCROLL
7351 21403C 05290 LD HL,3C40H ;SOURCE POINTER
7354 01C003 05300 LD BC,1024-64 ;MOVE COUNTER
7357 EDB0 05310 LDIR ;SCROLL THE DISPLAY
7359 21C03F 05320 LD HL,3FC0H ;POINT TO BEG OF BOT ROW
735C 11C13F 05330 LD DE,3FC1H ;POINT TO NEXT LOC.
735F 013F00 05340 LD BC,63 ;BEG ROW COUNT - 1
7362 3E20 05350 LD A,SPACE ;GET ASCII SPACE
7364 77 05360 LD (HL),A ;CLEAR FIRST LOC.
7365 EDB0 05370 LDIR ;CLEAR LINE
7367 21C03F 05380 LD HL,3FC0H ;GET NEW CURSOR POS.
736A 3E5F 05390 UPDN LD A,CRSCHR ;GET CURSOR CHAR.
736C 77 05400 LD (HL),A ;PUT CHAR. ON CRT
736D 228074 05410 LD (CURSOR),HL ;SAVE NEW CURSOR POS.
7370 C9 05420 RET ;DONE - RETURN
;
7371 21003C 05440 CLS LD HL,3C00H ;POINT TO BEG OF CRT
7374 11013C 05450 LD DE,3C01H ;POINT TO NEXT LOC.
7377 01FF03 05460 LD BC,1023 ;GET COUNT - 1
737A 3E20 05470 LD A,SPACE ;GET ASCII SPACE
737C 77 05480 LD (HL),A ;PUT IN FIRST LOC.
737D EDB0 05490 LDIR ;CLEAR SCREEN
737F 21003C 05500 LD HL,3C00H ;GET NEW CURSOR POS.
7382 228074 05510 LD (CURSOR),HL ;SAVE NEW POS.
7385 3E5F 05520 LD A,CRSCHR ;GET CURSOR CHAR.
7387 77 05530 LD (HL),A ;PUT ON CRT
7388 C9 05540 RET ;DONE - RETURN
;
05550 ;
05560 ;DEFINE MESSAGES:
7389 2A 05570 SIGMSG DEFM '*** TRS-80 TERMINAL EMULATOR V 1.0 ***'
73AF 0D 05580 DEFB 0DH
73B0 0D 05590 DEFB 0DH
73B1 00 05600 DEFB 00H
73B2 0D 05610 BDMMSG1 DEFB 0DH ;CARRIAGE RETURN
73B3 2A 05620 DEFM '**** CURRENT BAUD RATE IS '
73CD 00 05630 DEFB 00H ;END OF MESSAGE BDMMSG1
73CE 0D 05640 BDMMSG2 DEFB 0DH ;CARRIAGE RETURN
73CF 2A 05650 DEFM '**** SELECT NEW BAUD RATE:'
73E9 0D 05660 DEFB 0DH ;CARRIAGE RETURN
73EA 2A 05670 DEFM '**** A=110 B=300 C=600 D=1200'
740A 0D 05680 DEFB 0DH ;CARRIAGE RETURN
740B 2A 05690 DEFM '**** E=2400 F=4800 G=9600 H=19200 '
;
743A 00 05700 DEFB 00H
7431 0D 05710 BDMMSG3 DEFB 0DH
7432 2A 05720 DEFM '**** NEW BAUD RATE IS '
7448 00 05730 DEFB 00H
;
05750 ;DEFINE TABLES:
7449 11 05760 BDTBL DEFB 11H ;110 BAUD
744A 44 05770 DEFB 44H ;300 BAUD
744B 55 05780 DEFB 55H ;600 BAUD
744C 66 05790 DEFB 66H ;1200 BAUD
744D 88 05800 DEFB 88H ;2400 BAUD
744E 99 05810 DEFB 99H ;4800 BAUD
744F BB 05820 DEFB 0BBH ;9600 BAUD
7450 CC 05830 DEFB 0CCH ;19200 BAUD
7451 31 05840 BDTBL2 DEFM '110'
7454 00 05850 DEFB 0
7455 33 05860 DEFM '300'
7458 00 05870 DEFB 0
7459 36 05880 DEFM '600'
745C 00 05890 DEFB 0
745D 31 05900 DEFM '1200'
7461 00 05910 DEFB 0
7462 32 05920 DEFM '2400'
7466 00 05930 DEFB 0
7467 34 05940 DEFM '4800'
746B 00 05950 DEFB 0
746C 39 05960 DEFM '9600'
7470 00 05970 DEFB 0
7471 31 05980 DEFM '19200'
7476 00 05990 DEFB 0
;
06000 ;
06010 ;DEFINE STORAGE:
0001 06020 BDRATE DEFS 1 ;CURRENT BAUD RATE BYTF
0002 06030 BSTART DEFS 2 ;BUFFER START POINTER
0002 06040 BEND DEFS 2 ;BUFFER END POINTER
0002 06050 BCOUNT DEFS 2 ;BUFFER CHAR. COUNTER
0002 06060 INTVEC DEFS 2 ;TRS-80 INT VEC STORAGE
0002 06070 CURSOR DEFS 2 ;CURRENT CURSOR POSITION
0001 06080 TMRFLG DEFS 1 ;TIMER USE FLAG
0001 06090 PRFTLG DEFS 1 ;PRINTER OPERATION FLAG
0001 06100 CLRFLG DEFS 1 ;CLEAR KEY PRESSED FLAG
0001 06110 BSDEL DEFS 1 ;BACKSPACE/DELETE LOCATION
0002 06120 PRSTRT DEFS 2 ;PRINT BUFFER START POINTER
0002 06130 PREND DEFS 2 ;PRINT BUFFER END POINTER
0002 06140 PRCNT DEFS 2 ;PRINT BUFFER COUNTER
0388 06150 PRBUFR DEFS PRLEN ;PRINT BUFFER
0000 06160 ENDLBL DEFS 0 ;DUMMY LABEL
876B 06170 BUFLN EQU TOPMEM-ENDBL-20H ;CHAR BUFR LEN.
876B 06180 BUFFER DEFS BUFLN ;INPUT CHARACTER BUFFER
;
7000 06200 END TERM
00000 TOTAL ERRORS
14200 TEXT AREA BYTES LEFT

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3. Letters	11.
4.	12. Communications
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6.	14. NICE development
7.	15.
8. Visicalc	16. Entertainment

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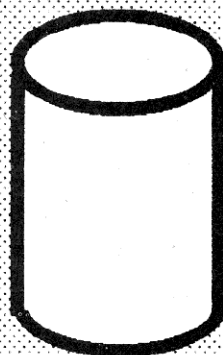
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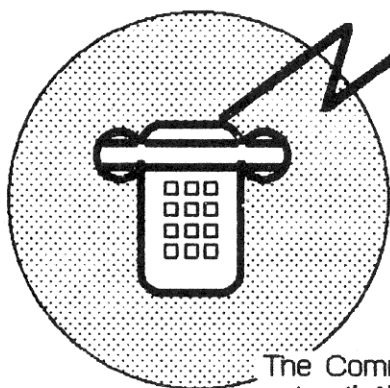


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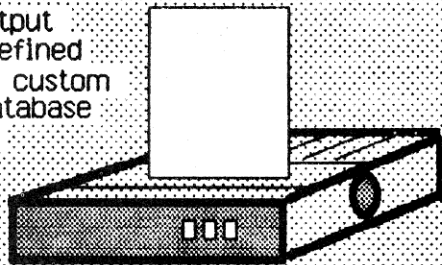
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Finding the Search Solution

by Joseph Trojak

In our December issue, we published "Finding the Search Solution," an article that discussed Mindex and Search, two Assembly-language programs that use signature screening techniques. We inadvertently omitted Program Listing 12; it appears below.—Eds.

Program Listing 12. MAP general routines.

```

00001  ;GR/SRC.1.2
00002  ;Jun 21, 1983
00003  ;
00004  ;MAP GENERAL PURPOSE ROUTINES
00005  ;COPYRIGHT 1983, SOFTSHELL CORPORATION ALL RIGHTS RESERVED
00006  ;
00007  GR PSECT ;begin relocatable program section
00008  ;
00009  ;public routines
00010  ;
00011  PUBLIC APPEND ;append one string to another
00012  PUBLIC EXDEC ;binary to decimal conversion
00013  PUBLIC DECB ;decimal to binary conversion
00014  PUBLIC DLNE ;draw dotted line width of screen
00015  PUBLIC DSPNBR ;display 5 char ASCII no. right justified
00016  PUBLIC DSPNBRLL ;display 5 char ASCII no. left justified
00017  PUBLIC EATBNK ;bypass leading blanks
00018  PUBLIC EATBNBK ;bypass leading non-blank char
00019  PUBLIC ERROR ;error display routine
00020  PUBLIC FSPEC ;get cmd line file spec(s)
00021  PUBLIC GETMFN ;get MAP file names (specs)
00022  PUBLIC LINE ;draw line width of screen
00023  PUBLIC MUAL0 ;multiply no. in A by 10
00024  PUBLIC MULL18 ;multiply no. in HL by 18
00025  PUBLIC PACKFS ;space compress file spec
00026  PUBLIC PARSEF ;parse file spec
00027  PUBLIC RECD ;fill buffer with 0's
00028  PUBLIC RECDL ;fill buffer with blanks
00029  PUBLIC TAPENT ;tap enter to continue routine
00030  ;
00031  ;public buffers
00032  ;
00033  PUBLIC TMPNAM,TMPEXT,TMPSPW,TMPDDR ;temp file spec table
00034  PUBLIC SNAM,SEXT,SPSW,SDDR ;src file spec table
00035  PUBLIC INAM,IEXT,IPSW,IDDR ;index file spec table
00036  PUBLIC ONAM,OEXT,OPSW,ODDR ;output file spec table
00037  ;
00038  ;calls to MODII or MODII
00039  ;
00040  ;
00041  EXTERN KBLINE,KBLIN3,KBCHAR,KWAIT,KEYIN,KBINIT
00042  EXTERN KBRK
00043  EXTERN VDCLS,VDLINE,VDCHAR,VDINIT
00044  EXTERN HOME,BOTTOM,NEWLN
00045  EXTERN CURPOS,POSOUR
00046  EXTERN ERASEL,ERASES
00047  EXTERN DIVIDE,MULT
00048  EXTERN ERDRSP
00049  EXTERN JFZDOS,DOSCMD
00050  EXTERN PTF
00051  ;pts to file spec on cmd line
00052  ;
00053  ;MODII/III buffers and I/O parm
00054  EXTERN ARROWD,ARROWL,ARROWR,BRKKEY,SWIDTH,PENULN
00055  ;
00056  ;S3 buffers
00057  ;
00058  EXTERN CWDLPS ;cmd line file spec (Y/N)
00059  EXTERN KEYBUF ;key buffer (temp for file spec)
00060  ;
00061  ;GETMFN
00062  ;
00063  ;get MAP file spec's
00064  ;entry: HL->file spec buffer
00065  ;exit: src. index and output
00066  ; file tables are loaded
00067  ; with file specs
00068  ; z=parse ok, NZ bad parse
00069  ; reg altered: AF,BC,DE,HL
00070  ; calls: PARSEF,APPEND
00071  ;
00072  GETMFN CALL PARSEF ;parse first file name
00073  RET NZ ;abort if error while parsing
00074  PUSH AF ;save A (first char after file spec 1)
00075  LD HL,TMPNAM ;move tmp file specs to source file specs
00076  LD DE,SNAM
00077  CALL APPEND ;move source file name to SNAM
00078  LD HL,TMPEXT
00079  LD DE,SEXT
00080  CALL APPEND ;move source file ext to SEXT
00081  LD HL,TMPSPW
00082  LD DE,SPSW
00083  CALL APPEND ;move source file password to SPSW
00084  LD HL,TMPDDR
00085  LD DE,SDDR
00086  CALL APPEND ;move source file drive to SDDR
00087  ;
00088  ;
00089  ;
00090  ;
00091  ;
00092  ;
00093  ;
00094  ;
00095  ;
00096  ;
00097  ;
00098  ;
00099  ;
00100  ;
00101  ;
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00103  ;
00104  ;
00105  ;
00106  ;
00107  ;
00108  ;
00109  ;
00110  ;
00111  ;
00112  ;
00113  ;
00114  ;
00115  ;
00116  ;
00117  ;
00118  ;
00119  ;
00120  ;
00121  ;
00122  ;
00123  ;
00124  ;

```

```

00125  GTMF3N PUSH AF
00126  LD HL
00127  LD A,(INAM)
00128  CP 0DH
00129  JP NZ,GTMF3X ;skip if index file name entered
00130  LD HL,SNAM
00131  LD DE,INAM
00132  CALL APPEND ;copy source name to index name
00133  ;
00134  GTMF3X LD A,(IEXT)
00135  CP 0DH
00136  JP NZ,GTMF3P ;skip if index file ext entered
00137  LD HL,MAPEXT
00138  LD DE,IEXT
00139  CALL APPEND ;put "MAP" in index file extension
00140  ;
00141  GTMF3P LD A,(IPSW)
00142  CP 0DH
00143  JP NZ,GTMF3D ;skip if index file psd entered
00144  LD HL,IPSW
00145  LD DE,IPSW
00146  CALL APPEND ;copy source psd to index psd
00147  ;
00148  GTMF3D LD A,(IDDR)
00149  CP 0DH
00150  JP NZ,GTMF5 ;skip if output file drive entered
00151  LD HL,SDDR
00152  LD DE,IDDR
00153  CALL APPEND ;copy source dr to index dr
00154  ;
00155  ;
00156  ;
00157  ;
00158  GTMF5 NOP
00159  LD A,0DH
00160  LD (ONAM),A ;reset output file specs
00161  LD (OEXT),A
00162  LD (OPSW),A
00163  LD (ODDR),A
00164  ;
00165  POP HL
00166  POP AF
00167  CP 0DH
00168  JP NZ,GTMF5N ;skip 3rd file spec if BOR
00169  CALL PARSEF ;get third file spec
00170  RET NZ ;abort if error
00171  PUSH AF ;save A (first char after file spec 3)
00172  PUSH HL ;save HL (first char after file spec 3)
00173  ;
00174  ;
00175  LD HL,TMPNAM ;move temp file specs to output file specs
00176  LD DE,ONAM
00177  CALL APPEND
00178  LD HL,TMPEXT ;move output file name to ONAM
00179  LD DE,OEXT
00180  CALL APPEND ;move output file ext to OEXT
00181  LD HL,TMPSPW
00182  LD DE,OPSW
00183  CALL APPEND ;move output file password to OPSW
00184  LD HL,TMPDDR
00185  LD DE,ODDR
00186  CALL APPEND ;move output file drive to ODDR
00187  POP HL
00188  POP AF
00189  ;
00190  ;
00191  ;
00192  ;
00193  ;
00194  GTMF5N PUSH AF
00195  LD A,(ONAM)
00196  CP 0DH
00197  JP NZ,GTMF5X ;skip if output file name entered
00198  LD HL,SNAM
00199  LD DE,ONAM
00200  CALL APPEND ;copy source name to index name
00201  ;
00202  GTMF5X LD A,(OEXT)
00203  CP 0DH
00204  JP NZ,GTMF5P ;skip if output file ext entered
00205  LD HL,OUTEXT
00206  LD DE,OEXT
00207  CALL APPEND ;put "OUT" in output file extension
00208  ;
00209  GTMF5P LD A,(OPSW)
00210  CP 0DH
00211  JP NZ,GTMF5D ;skip if output file psd entered
00212  LD HL,IPSW
00213  LD DE,OPSW
00214  CALL APPEND ;copy source psd to output psd
00215  ;
00216  GTMF5D LD A,(ODDR)
00217  CP 0DH
00218  JP NZ,GTMF7 ;skip if output file drive entered
00219  LD HL,SDDR
00220  LD DE,ODDR
00221  CALL APPEND ;copy source dr to output dr
00222  ;
00223  ;
00224  ;
00225  ;
00226  ;
00227  ;
00228  ;
00229  ;
00230  ;
00231  ;
00232  ;
00233  ;
00234  ;
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00255  ;
00256  ;
00257  ;
00258  ;
00259  ;
00260  ;
00261  ;
00262  ;
00263  ;
00264  ;
00265  ;
00266  ;
00267  ;
00268  ;
00269  ;
00270  ;
00271  ;
00272  ;
00273  ;
00274  ;
00275  ;

```

Listing 12 continued

Listing 12 continued

```

00276 CP      ' '      ;? blank
00277 JP      Z,PRSNK   ;? comma
00278 CP      ' '      ;? comma
00279 JP      Z,PRSCOM   ;? EOR
00280 CP      ' '      ;? EOR
00281 JP      Z,PRSDH    ;? semicolon
00282 CP      ' '      ;? semicolon
00283 JP      Z,PRSEMI    ;? semicolon
00284 LD      (DE),A    ;move to temp name buffer
00285 LD      A,0
00286 CP      C
00287 JP      Z,PRSEERR   ;error if name >8 char
00288 DEC      C
00289 INC      HL
00290 INC      DE
00291 JR      PRSLP1
00292
00293 PRSEXT LD      A,0DH   ;.....parse ext
00294 LD      (DE),A
00295 LD      DE,TMPEXT
00296 INC      HL
00297          ;pt to char after '/'
00298 PRSLP2 LD      A,(HL)
00299 CP      ' '
00300 JR      Z,PRSPSW
00301 CP      ' '
00302 JR      Z,PRSDDR
00303 CP      ' '
00304 JP      Z,PRSNK
00305 CP      ' '
00306 JP      Z,PRSCOM
00307 CP      ' '
00308 JP      Z,PRSDH
00309 CP      ' '
00310 JP      Z,PRSEMI
00311 LD      (DE),A
00312 LD      A,0
00313 CP      C
00314 JP      Z,PRSEERR   ;error if ext > 3 char
00315 DEC      C
00316 INC      HL
00317 INC      DE
00318 JR      PRSLP2
00319
00320 PRSPSW LD      A,0DH   ;.....parse password
00321 LD      (DE),A
00322 INC      HL
00323 LD      DE,TMPFSW
00324 LD      C,8
00325 PRSLP3 LD      A,(HL)
00326 CP      ' '
00327 JR      Z,PRSDDR
00328 CP      ' '
00329 JR      Z,PRSNK
00330 CP      ' '
00331 JR      Z,PRSCOM
00332 CP      ' '
00333 JP      Z,PRSDH
00334 CP      ' '
00335 JR      Z,PRSEMI
00336 LD      (DE),A
00337 LD      A,0
00338 CP      C
00339 JP      Z,PRSEERR   ;error if password > 8
00340 DEC      C
00341 INC      HL
00342 INC      DE
00343 JR      PRSLP3
00344
00345 PRSDDR LD      A,0DH   ;.....parse drive
00346 LD      (DE),A
00347 INC      HL
00348 LD      DE,TMPDDR
00349 LD      C,1
00350 PRSLP4 LD      A,(HL)
00351 CP      ' '
00352 JR      Z,PRSNK
00353 CP      ' '
00354 JR      Z,PRSCOM
00355 CP      ' '
00356 JP      Z,PRSDH
00357 CP      ' '
00358 JR      Z,PRSEMI
00359 LD      (DE),A
00360 LD      A,0
00361 CP      C
00362 JR      Z,PRSEERR   ;error if drive > 1
00363 DEC      C
00364 INC      HL
00365 INC      DE
00366 JR      PRSLP4
00367
00368 PRSNK LD      A,0DH   ;blanks encountered
00369 LD      (DE),A
00370 CALL      EATBNK
00371 LD      A,(HL)
00372 CP      0DH
00373 JR      Z,PRSDH
00374 CP      ' '
00375 JR      NZ,PRSK
00376 INC      HL
00377 CALL      EATBNK
00378 JR      PRSK
00379 PRSCOM INC      HL
00380 LD      A,0DH
00381 LD      (DE),A
00382 CALL      EATBNK
00383 JR      PRSK
00384 PRSEMI NOP
00385 LD      A,0DH
00386 LD      (DE),A
00387 LD      A,';'
00388 JR      PRSK
00389 LD      A,0DH
00390 LD      (DE),A
00391 PRSK CP      A
00392 RET
00393 PRSEERR LD      A,1
00394 CP      0
00395 RET
00396
00397 ;.....
00398 TMPEXT DEFS 9
00399 TMPFSW DEFS 9
00400 TMPDDR DEFS 2
00401
00402 ;-----
00403 ;PACKFS
00404 ;pack file spec
00405 ;entry: HL->file spec table
00406 ;reg altered: AF,DE,HL
00407 ;calls: APPEND
00408 ;exit pts: PACK06
00409
00410 PACKFS LD      (STOFS),HL
00411 CALL      APPEND
00412 LD      A,0DH
00413 LD      (DE),A
00414 LD      DE,9
00415 LD      HL,DE
00416 ADD      HL,DE
00417 POP      DE
00418 LD      A,0DH
00419 LD      (HL)
00420 JR      Z,PACK02
00421 LD      A,'/'
00422 LD      (DE),A
00423 INC      DE
00424 LD      A,0DH
00425 LD      (DE),A
00426
00427 CALL      APPEND
00428 LD      HL,(STOFS)
00429 LD      DE,13
00430 ADD      HL,DE
00431 POP      DE
00432 LD      A,0DH
00433 CP      (HL)
00434 JR      Z,PACK04
00435 LD      A,' '
00436 LD      (DE),A
00437 INC      DE
00438 LD      A,0DH
00439 LD      (DE),A
00440 CALL      APPEND
00441 LD      HL,(STOFS)
00442 LD      DE,22
00443 LD      HL,DE
00444 POP      DE
00445 LD      A,0DH
00446 CP      (HL)
00447 JR      Z,PACK06
00448 LD      A,' '
00449 LD      (DE),A
00450 INC      DE
00451 LD      A,0DH
00452 LD      (DE),A
00453 CALL      APPEND
00454 RET
00455
00456 STOPS DEFW 0
00457
00458 ;-----
00459 ;EATBNK
00460 LD      A,' '
00461 LD      (HL)
00462 LD      HL,EATBNK
00463 LD      HL,EATBNK
00464 LD      HL,EATBNK
00465 LD      HL,EATBNK
00466 LD      HL,EATBNK
00467 LD      HL,EATBNK
00468 LD      HL,EATBNK
00469 LD      HL,EATBNK
00470 LD      HL,EATBNK
00471 LD      HL,EATBNK
00472 LD      HL,EATBNK
00473 LD      HL,EATBNK
00474 LD      HL,EATBNK
00475 LD      HL,EATBNK
00476 LD      HL,EATBNK
00477 LD      HL,EATBNK
00478 LD      HL,EATBNK
00479 LD      HL,EATBNK
00480 LD      HL,EATBNK
00481 LD      HL,EATBNK
00482 LD      HL,EATBNK
00483 LD      HL,EATBNK
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00535 LD      HL,EATBNK
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00555 LD      HL,EATBNK
00556 LD      HL,EATBNK
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00559 LD      HL,EATBNK
00560 LD      HL,EATBNK
00561 LD      HL,EATBNK
00562 LD      HL,EATBNK
00563 LD      HL,EATBNK
00564 LD      HL,EATBNK
00565 LD      HL,EATBNK
00566 LD      HL,EATBNK
00567 LD      HL,EATBNK
00568 LD      HL,EATBNK
00569 LD      HL,EATBNK
00570 LD      HL,EATBNK
00571 LD      HL,EATBNK
00572 LD      HL,EATBNK
00573 LD      HL,EATBNK
00574 LD      HL,EATBNK
00575 LD      HL,EATBNK
00576 LD      HL,EATBNK
00577 LD      HL,EATBNK

```

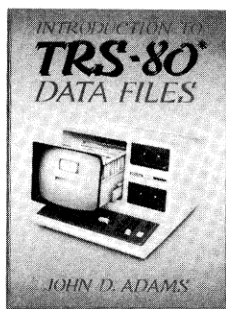
Listing 12 continued

Listing 12 continued

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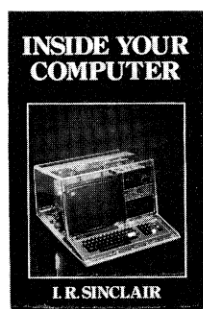
00578      LD      D,(IY+1)
00579      BXLPI   OR      A          ;clear carry
00580      SBC     HL,DE
00581      JP      C,BXJP1
00582      INC     A
00583      JR      BXLPI           ;loop
00584      BXJP1   ADD     HL,DE
00585      ADD     A,48
00586      LD      (IX+0),A
00587      INC     IX
00588      INC     IY
00589      INC     IY
00590      LD      A,5
00591      CP      C
00592      JR      NZ,BXLP0
00593
00594      ;conversion complete
00595      ;now blank out leading 0's
00596      LD      HL,DECBUF
00597      LD      A,'0'
00598      BXJP3   CP      (HL)
00599      JR      NZ,BXJP5
00600      INC     HL
00601      JR      BXLPI           ;loop
00602      BXJP5   LD      HL,DECBUF
00603      LD      A,' '
00604      CP      (HL)
00605      JR      NZ,BXJP7
00606      LD      (HL),'0'
00607      LD      HL,DECBUF
00608      RET
00609      P10TAB  DEFW    10000
00610      DEFW    1000
00611      DEFW    100
00612      DEFW    10
00613      DEFW    1
00614      DECBUF DEFB    0
00615      DEFB    0
00616      DEFB    3
00617      ;-----
00618      ;//////////
00619      DECBX   NOP             ;1-5 char ASCII dec to bin conver
00620      ;entry HL->5 char buffer
00621      ;no. string ends with 00H
00622      ;exit (HL) has binary no.
00623      ;Z valid. NZ not valid
00624
00625      LD      DE,0
00626      LD      (SUM),DE
00627      LD      C,0
00628      DECBX2  LD      A,(HL)
00629      CP      00H
00630      JP      Z,DECBX3
00631      INC     HL
00632      INC     C
00633      JP      DECBX2
00634
00635      DECBX3  NOP
00636      LD      A,0
00637      CP      C
00638      JP      Z,DECBX0
00639
00640      LD      IY,P10TAB
00641      DEC     HL
00642      PUSH    HL
00643      POP     IX
00644      LD      B,1
00645      ;
00646      DECBX4  NOP
00647      LD      A,0
00648      CP      C
00649      JP      Z,DECBX7
00650
00651      LD      A,(IX+0)
00652      CP      0
00653      JP      Z,DECBX7
00654      CP      58
00655      JP      F,DECBX9
00656      CP      48
00657      JP      M,DECBX9
00658      SUB     48
00659      ;////
00660      PUSH    AF
00661      LD      A,5
00662      CP      B
00663      JP      NZ,DECBX5
00664
00665      POP     AF
00666      ;5th digit routine
00667      JP      M,DECBX6
00668      JP      NZ,DECBX9
00669      LD      HL,5535
00670      LD      DE,(SUM)
00671      OR      A
00672      SBC     HL,DE
00673      JP      C,DECBX9
00674      JP      DECBX6
00675      ;////
00676      DECBX5  POP     AF
00677      ;////
00678      DECBX6  LD      L,(IY+0)
00679      LD      H,(IY+1)
00680      CALL    MULT
00681      LD      DE,(SUM)
00682      ADD     HL,DE
00683      LD      (SUM),HL
00684
00685      DEC     IY
00686      DEC     IY
00687      DEC     IX
00688      DEC     C
00689      INC     B
00690      JP      DECBX4
00691
00692      DECBX7  NOP             ;conversion complete
00693      LD      HL,(SUM)
00694      SET     0,A
00695      RET
00696      DECBX8  NOP
00697      DECBX9  LD      HL,0
00698      SET     1,A
00699      RET
00700      SUM      DEFW    0
00701      ;//////////
00702      ;DECBX   decimal to bin conversion
00703      ;no. ends with 00H or blank
00704      ;entry HL->start of string
00705      ;exit: valid (HL)=bin no., A = set 0
00706      ;       invalid (HL)=0, A = set 1
00707      ;calls: MUHL0
00708      ;destroys: A,D,E,H,L
00709
00710      DECBX   CALL    EATBNK
00711      LD      A,(HL)
00712      CP      00H
00713      JR      Z,DECBX2
00714      LD      DE,0
00715      LD      (SUM),DE
00716      LD      A,(HL)
00717
00718      PUSH    HL
00719      CP      48
00720      JP      M,DECBXB
00721      CP      58
00722      JP      P,DECBXB
00723      SUB     48
00724      LD      D,0
00725      LD      E,A
00726      LD      HL,(SUM)
00727      ADD     HL,DE
00728      JP      C,DECBXB
00729      LD      (SUM),HL
00730
00731      POP     HL
00732      INC     HL
00733      PUSH    HL
00734      LD      A,(HL)
00735      CP      00H
00736      JR      Z,DECBXB
00737      CP      2,DECBXB
00738      RET
00739      LD      HL,(SUM)
00740      LD      DE,6554
00741      OR      A
00742      SBC     HL,DE
00743      JP      P,DECBXB
00744      LD      HL,(SUM)
00745      CALL    MUHL0
00746      LD      (SUM),HL
00747
00748      POP     HL
00749      JR      DECBXL
00750      DECBXB  POP     HL
00751      LD      HL,(SUM)
00752      SET     0,A
00753      RET
00754      DECBXB  POP     HL
00755      DECBXB2  LD      HL,0
00756      SET     1,A
00757      RET
00758      SUM      DEFW    0
00759
00760      ;-----
00761      ;MUHL0 and MUHL10
00762      ;entry: A or HL contains no.
00763      ;exit: HL contains product
00764      ;reg altered: AF,DE,HL
00765      ;mult # in A by 10
00766      ;move A to HL
00767      ;mult # in HL by 10
00768      ;HL&DE contain 2*no.
00769      ;HL contains 4*no.
00770      ;HL contains 8*no.
00771      ;8*no. + 2*no.
00772      RET
00773
00774      ;-----
00775      ;DSPNBR
00776      ;display bin no. as decimal no.
00777      ;dsp at current cursor position
00778      ;entry: (HL) = no.
00779      ;reg altered: HL
00780
00781      DSPNBR  PUSH    AF
00782      PUSH    BC
00783      PUSH    DE
00784      PUSH    IX
00785      PUSH    IY
00786      CALL    BXDEC
00787      CALL    VDLINE
00788      POP     IY
00789      POP     IX
00790      POP     DE
00791      POP     BC
00792      POP     AF
00793      RET
00794
00795      ;-----
00796      ;DSPNBR
00797      ;dsp bin no. as left justified dec no.
00798      ;entry: (HL) = no.
00799      ;reg altered: HL
00800
00801      DSPNBR  PUSH    AF
00802      PUSH    BC
00803      PUSH    DE
00804      PUSH    IY
00805      CALL    BXDEC
00806      CALL    EATBNK
00807      CALL    VDLINE
00808      POP     IY
00809      POP     IX
00810      POP     DE
00811      POP     BC
00812      POP     AF
00813      RET
00814
00815      ;-----
00816      ;DLINE
00817      ;draws dotted line for width of screen
00818      ;saves DE and BC registers
00819      ;display line
00820      LD      A,'.'
00821      CALL    LINE
00822      POP     BC
00823      POP     DE
00824      RET
00825
00826      ;-----
00827      ;LINE
00828      ;draws line for width of screen
00829      ;entry: A=char for line
00830      ;reg altered: AF,C,DE
00831
00832      LINE    LD      (LCHAR),A
00833      LD      C,WIDTH
00834      LD      A,(LCHAR)
00835      CALL    VDCHAR
00836      DEC     C
00837      LD      A,0
00838      CP      C
00839      JR      NZ,LINE2
00840      RET
00841      LCHAR    DEFB    ' '
00842      ;-----
00843      ;FSPEC
00844      ;get file spec cmd line
00845      ;FSPEC is different for Mod II and III
00846      ;HL->file spec after cmd
00847
00848      FSPEC   CALL    PTFS
00849      LD      DE,KEYBUF
00850      CALL    APPEND
00851      LD      A,' '
00852      LD      (CMDLFS),A
00853      LD      A,(KEYBUF)
00854      CP      00H
00855      RET     Z
00856      LD      A,'y'
00857      LD      (CMDLFS),A
00858      RET
00859
00900      END

```

Introduction to TRS-80 Data Files

Learn by doing with this guide to writing a data base manager. This book, with its accompanying software, takes you through a simple mailing list program to teach you about sequential and then random access files. The construction of a DBM and the techniques for moving data to and from disks are discussed. **Book and TRS-80 disk \$24.97 BK7398 approx. 144 pp.**



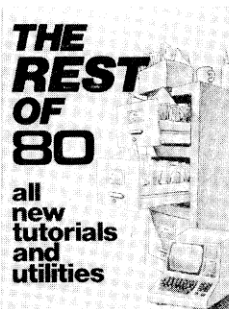
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Find out what goes on inside your TRS-80. Inside Your Computer explains microcomputer circuits and how they work. Topics include chips, interpreters, circuits, machine language, binary numbers, algorithms, ASCII code, software, and what they all mean to the computer. Includes many photographs and schematics. **\$12.97 BK7390 108 pp.**



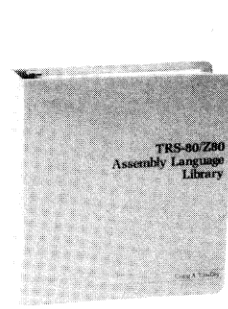
TRS-80 as a Controller

Learn to control outside devices with a TRS-80. This book is an introduction to interfacing, with simple, inexpensive projects. Applications include controlling lights and switches, building a small computer, and suggestions for more complex projects. The book applies to the Model III and, with minor conversions, to the Model I. **\$12.97 BK7394 192 pp.**



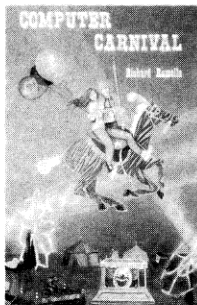
The Rest of 80

Get the 80 Micro articles so good we put them in a book. These 31 never-before-published tutorials and utilities were hand-picked for Model I and Model III users. You'll get graphics sorts, renumbering, Pascal tutorials, and more. Both BASIC and assembly-language programs are included. Complete listings are given, with photographs, schematics, and examples. **\$9.97 BK7392 232 pp.**



TRS-80/Z80 Assembly Language Library

Learn to use assembly language on the Model I to its full capacity. Two TRSDOS-compatible disks are included, with programs worth many times the book's cost. You'll learn about TRS-80 hardware and software, general Z80 routines, and TRS-80 utility programs. Examples show you how to apply the information to your everyday programming. Model III conversions are given. \$4.50 shipping and handling. **\$34.97 BK7395 355 pp. Disks included**



Computer Carnival

For the Models I and III. These sixty programs for beginners will entertain and educate. Children will find mazes, word games, graphics, puzzles, and quizzes. Card games, logic tests, word and number quizzes, and letter guesses make Computer Carnival a learning experience. The Carnival Companion cassette of all sixty programs is also available. **Computer Carnival and Carnival Companion \$24.97 CC7389 Computer Carnival \$16.97 BK7389 218 pp. Carnival Companion \$9.97 TP7389**

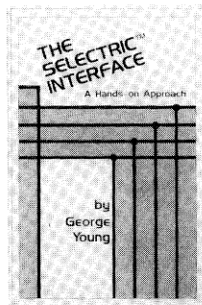
TEXTEDIT

a complete word processing system in kit form.

by
Irwin Rappaport
A WAYNE GREEN PUBLICATION

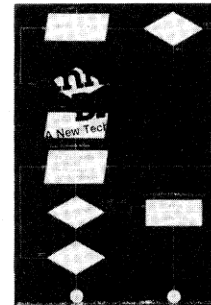
TEXTEDIT

Build your own word processor with the TEXTEDIT kit. This Disk BASIC system is built in modules, so you can modify them or use only the parts you need. Features include complete editing, search, replace, and count, and upper/lowercase typing on an unmodified Model I. Model III users need the TRSDOS CONVERT utility to use the disk. TEXTEDIT is compatible with any major DOS. It operates with one drive; two drives or copy utility needed to transfer programs to system disk. **Book and disk package \$24.97 CC7387**



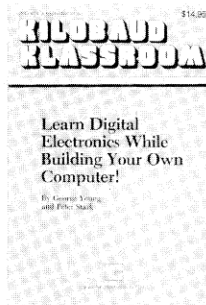
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You can turn an IBM Selectric I/O writer into a letter-quality printer for your TRS-80. The Selectric Interface gives you the programs and step-by-step instructions you need for Selectric models 2740, 2980, and Dura 1041. With slight modification, the instructions will also work for other chips. **\$12.97 BK7388 124 pp.**



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80 micro's SECOND ANNUAL READER'S CHOICE AWARDS



Like a receding wave, the deluge of Reader's Choice ballots has ebbed to a dribble. No more stacks of ballots waiting to be punched in on Monday mornings. No more smoke rising from the vents of the Model III. From the beleaguered editorial and technical staff of *80 Micro*, here are the results.

We counted fewer write-ins this year, no doubt due to our decision to expand the number of nominees and increase the number of categories to 38. Only three write-ins placed this year: SuperScripsit (how could we have left it out?), Donkey King, and GEAP Dotwriter.

Radio Shack, a natural heavy in the

balloting, took 21 categories and placed 35 times overall. Among the finalists for Model I/III disk operating systems, Radio Shack is noticeably absent.

Heaviest response was for Model I/III disk operating systems, word processors, and utilities. Again this year, the first place winners are NEW-

DOS/80, Scripsit, and Super Utility Plus, respectively.

Each category includes the three top finishers, except in the case of ties or where we could determine no clear third place winner. Although we made no provision for the protest vote, we should mention that there were few. These ranged from blank ballots to a few dirty words (except for Tim Schuyler, of Chico, CA, who taped his ballot to a brick).

A special thanks goes to David Walonick for his efforts in compiling this year's ballots, and thanks to the many readers who mailed in ballots. The results speak for themselves. ■

Model I/III

Accounting

1. Maxi Cras (Adventure International)
2. Accounts Payable (RS)
3. Datagraph (Micro Software Systems)

Business

1. VisiCalc (VisiCorp)
2. Tallymaster (Prosoft)

Data Base Management

1. Profile III Plus (RS)

2. AIDS-III (Softrends)

3. Profile (RS)

Maxi Manager (Adventure International)

Data Communications

1. Omniterm (Lindbergh Systems)
2. Modem 80 (Alternate Source)
3. Videotext Communications Package (RS)

Disk Operating Systems

1. NEWDOS/80 (Apparat)

2. DOSPLUS (Micro-Systems Software)

3. LDOS 5.1 (Logical Systems)

Education

1. Typing Tutor (Microsoft)
2. K-8 Math with Student Management (RS)
3. Typing Teacher (Instant Software)

Engineering

1. Active Filter Design (Howard W. Sams & Co.)

2. Surface Plot (Micro Labs)
3. Plotting Graphs for Video Display (Howard W. Sams & Co.)

Games

1. Flight Simulator (Sublogic Group)
2. Scarfman (Cornsoft Group)
3. Star Fighter (Adventure International)

Graphics

1. Powerdraw (Powersoft Products)
2. Powerdot (Powersoft Products)
3. GEAP Dotwriter (JF Consulting)

Home/Personal Management

1. Budget Management (RS)
2. Super-Log II (Micro-80)
3. Stockpak (RS)

Music

1. Orchestra-90 (Software Affair)
2. Orchestra-85 (Software Affair)
3. Fanfare (Software Affair)

Spelling Checkers

1. Electric Webster (Cornucopia Software)
2. Scripsit Dictionary (RS)
3. Hexspell (Hexagon Systems)

Utilities

1. Super Utility Plus (Powersoft Products)
2. EDTASM (RS)
3. Editor/Assembler (Series I) (RS)

Word Processors

1. Scripsit (RS)
2. Newsript (Prosoft)
3. SuperScripsit (RS)

Model II/12/16

Accounting

1. Accounts Receivable (RS)
2. Payroll (RS)
3. Accounts Payable (RS)
3. Payroll (Taranto & Associates)

Business

1. VisiCalc (VisiCorp)
2. General Ledger (RS)
3. AR/INV (The Software Terminal)

Data Base Management

1. Profile II (RS)
2. AIDS-III (Meta-Tech)
3. Q-Pro 4 (Quick-N-Easi Products)

Data Communications

1. Videotex (RS)

2. Omnitem (Lindbergh Systems)
3. ST80-III (Small Business Systems Group)

Disk Operating Systems

1. TRSDOS (RS)
2. DOSPLUS II (Powersoft Products)
3. CP/M (Digital Research)

Education

1. NutriCalc (PCD Systems)
1. Microtyping (Hayden)
2. Instant Mathematical Programming (PCD Systems)
3. Random Access Volume II Advanced File Handling (D.S.C. Publishing)

Engineering

1. Critical Path Project Management (McClintock Corp.)
- Solar Collector F-Chart Calculation (McClintock Corp.)
2. Duct Design (McClintock Corp.)
3. Finite Element Analysis (McClintock Corp.)

Games

1. Adventure (Adventure International)
2. Sargon II (Hayden)
3. Starship/1 (two/sixteen magazine)

Home/Personal Management

1. Powermail (Powersoft Products)
2. Supertax (Rockware Data Group)
3. Home Budget (Howe Software)
3. Mailer (PCD Systems)

Spelling Checkers

1. Scripsit Dictionary (RS)
2. Grammatik (Aspen Software)

Utilities

1. Editor/Assembler (RS)
2. Profile Archive (RS)
3. 3D Plotter (Maxtek)
- Development Package (Racet Computes)

Word Processors

1. Scripsit 2.0 (RS)
2. WordStar (Micro Pro)
3. Electric Pencil (Michael Shrayner)

Color Computer

Accounting

1. Single Entry General Ledger (Universal Data Research)

General Ledger (Universal Data Research)

2. Payroll (Universal Data Research)
3. Inventory II (Universal Data Research)

Business

1. Spectaculator (RS)
2. Personal Finance (RS)
3. Graphic Software (Kern Publications)

Data Base Management

1. Data Base Manager (Universal Data Research)
2. TIMS (Sugar Software)
3. C.C. File (Trans Tek)

Data Communications

1. COLORCOM/E (Eigen Systems)
2. Super Color Terminal (Nelson Software)
3. Microtext (The Micro Works)

Disk Operating Systems

1. TRSDOS (RS)
2. FLEX/FMate (RS) (Data Comp)

Education

1. Color LOGO (RS)
2. Typing Tutor (RS)
3. Advanced Graphics (RS)

Games

1. Zaxxon (Datasoft)
2. Donkey King (Tom Mix Software)
3. ROM-Save (B. Erickson Software)

Graphics

1. Art Gallery (RS)
2. MPP Graphics (Superior Graphics Software)
3. Images II (RS)

Home/Personal Management

1. Color File (RS)
2. The Color Accountant (Programmer's Institute)
3. Audio Spectrum Analysis (RS)

Spelling Checkers

1. Spell'N Fix (Star-Kits)
2. Spell-Rite (Eigen Systems)

Utilities

1. EDTASM+ (RS)
2. Diagnostic ROM (RS)

Word Processors

1. Telewriter-64 (Cognitec)
2. Color Scripsit (RS)
3. Super Color Writer II (Nelson Software)

MicroPrice SPECIALS OF THE MONTH!

NEXT DAY SHIPMENT OF THE LNW 80 MODEL II



This computer has it all! TRS-80™ Model I and CP/M® software compatibility with two operating systems; DOSPLUS 3.4 and CP/M 2.2. The LNW 80 MOD II can read and write the 5¼" disk formats of several CP/M computers including: OSBORNE, KAYPRO, XEROX 820, CP/M 86 as well as standard 8" IBM format. Standard features: 96K of RAM, parallel and serial ports, cassette and joystick ports, RGB and Composite Color interfaces, HI-RES graphics and much more! Six month warranty.

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FX 80 \$569.00
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NEW Princeton Graphics PGS-
HX12 HI-RES RGB color
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NEW tilt and swivel monitor stand -
supports any monitor \$29.95

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Micro Mainframe MOD III disk
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Something for Everyone

by Richard Ramella

```

100 REM * SPDWRD * TRS-80
110 REM * FUN HOUSE * JAN. '84 * RICHARD RAMELLA
120 REM * WORKS ON ALT. MODELS
130 CLEAR 500
140 CLS
150 INPUT "TYPE THE SECRET SENTENCE";A$
160 CLS
170 PRINT "GUESSER, TAP ENTER"
180 INPUT X
190 FOR A=1 TO LEN(A$)
200 B$=MID$(A$,A,1)
210 IF B$<>"A" AND B$<>"E" AND B$<>"I" AND B$<>"O" AND B$<>"U" T
HEN PRINT B$;
220 NEXT A
230 PRINT
240 INPUT "GUESSER, WHAT'S THE ANSWER";X$
250 IF X$<>A$ THEN PRINT "NO, IT WAS": PRINT A$ ELSE PRINT "RIGH
T !!"
260 END
  
```

Speedword.

```

100 REM * DAYS ALIVE ! * TRS-80
110 REM * FUN HOUSE * JAN. '84 * RICHARD RAMELLA
120 REM * WORKS ON ALT. MODELS
130 CLS
140 PRINT "LET'S SEE HOW MANY DAYS"
150 PRINT "YOU'VE BEEN ALIVE..."
160 INPUT "WHEN READY TO GO, TAP ENTER";X
170 CLS
180 PRINT "NOW WE NEED YOUR BIRTHDATE."
190 PRINT "ENTER MONTH, DAY, YEAR SEPARATED BY COMMAS."
200 PRINT "EXAMPLE: MAY 1, 1963 WOULD BE 5,1,63"
210 INPUT MO,DA,YR
220 GOSUB 340
230 J=K
240 CLS
250 INPUT "NOW ENTER TODAY'S DATE IN SAME STYLE";MO,DA,YR
260 CLS
270 GOSUB 340
280 DA=K-J
290 PRINT "YOUR LIFE IS NOW"
300 PRINT DA;"GREAT DAYS LONG."
310 FOR T=1 TO 1000
320 NEXT T
330 END
340 IF MO=1 OR MO=2 THEN YR=YR-1: MO=MO+13: GOTO 360
350 MO=MO+1
360 K=365*YR+INT(.25*YR)+INT(30.600994*MO)+DA
370 RETURN
380 END
  
```

Days Alive!

On New Year's Day there are only two kinds of people—those who watch football games and those who don't. If you don't, come to the 1984 celebration here in the Fun House. As always, I admit all the kids first. If any room is left after that, we might squeeze in a few adults.

I invite everyone with a TRS-80 *anything* to this celebration. The four programs this month should work on any TRS-80 that you haven't recently dipped in molasses. In truth, I have to rule out Model I, Level I users, but I don't think anyone seriously uses Level I anymore.

We're going to try some games and activities that might tell you some things you don't know about yourself. Spdwr, which is short for speedword, is a game for at least two players. Days Alive! tells you how many

The Key Box

All TRS-80 Models
4K RAM, Cassette Basic
32K RAM, Disk Basic
Color Basic

days have passed since you were born.

Using the figure discovered in Days Alive, you can run A Week of Birthdays and find out the day of the week on which you were born—or when anything else happened. Last is Guess Your Name, in which the computer doggedly tries to find out who you are and does so with great success as long as you give straight answers to its yes/no questions.

As you enter the party room, I must ask you not to blow any horns or clack any clackers. I was up last night celebrating the New Year till nearly 10:30 p.m. and need a little quiet today.

SPDWRD

Player 1 leaves the room or at least turns away from the computer screen. Player 2 types in a secret sentence of fewer than 250 characters, then taps the enter key.

Player 1 returns and taps the enter key. The secret sentence appears on the screen with all vowels left out. Player 2 studies this result and tries to type the sentence as it was originally entered. The TRS-80 recognizes success.

After they argue about the fairness of the tricky secret sentence entered by Player 1, the two players exchange roles.

That's all there is to it, but that's enough. You'll be surprised how giggly some statements become without vowels.

Days Alive!

On some days I am totally uninterested in knowing how many thousands of days I've been alive. I can't even remem-

```

100 REM * A WEEK OF BIRTHDAYS * TRS-80
110 REM * FUN HOUSE * JAN. '84 * RICHARD RAMELLA
120 REM * WORKS ON ALT. MODELS
130 CLS
140 DATA SUNDAY,MONDAY,TUESDAY,WEDNESDAY,THURSDAY,FRIDAY,SATURDA
Y
150 FOR A=1 TO 7
160 READ A$(A)
170 NEXT A
180 INPUT "TYPE TODAY'S DAY OF WEEK";Z$
190 FOR G=1 TO 7
200 IF A$(G)=Z$ THEN C=G: GOTO 230
210 NEXT G
220 PRINT "DID YOU NOT ENTER A DAY OF THE WEEK?": GOTO 180
230 CLS
240 INPUT "HOW MANY DAYS HAVE YOU LIVED";X
250 IF X>364 THEN X=X-364: GOTO 250
260 IF X<8 THEN 290
270 X=X-7
280 GOTO 260
290 FOR D=X TO 1 STEP -1
300 C=C-1
310 IF C=0 THEN C=7
320 NEXT D
330 PRINT "YOU WERE BORN ON A ";A$(C)
340 PRINT
350 ON C GOTO 420,360,370,380,390,400,410
360 PRINT "MONDAY'S CHILD IS FAIR OF FACE.": END
370 PRINT "TUESDAY'S CHILD IS FULL OF GRACE": END
380 PRINT "WEDNESDAY'S CHILD IS FULL OF WOE": END
390 PRINT "THURSDAY'S CHILD HAS TO FAR TO GO.": END
400 PRINT "FRIDAY'S CHILD IS LOVING AND GIVING": END
410 PRINT "SATURDAY'S CHILD WORKS HARD FOR ITS LIVING.": END
420 PRINT "THE CHILD THAT'S BORN ON THE SABBATH DAY"
430 PRINT "IS BONNY AND BLITHE, AND GOOD AND GAY": END
440 END

```

A Week of Birthdays.

Guess Your Name.

```

100 REM * GUESS YOUR NAME *
110 REM * FUN HOUSE * JAN '84 * RICHARD RAMELLA
120 REM * WORKS ON ALT. MODELS
130 CLS
140 CLEAR 200
150 A$="ABCDEFGHIJKLMNOPQRSTUVWXYZ"
160 PRINT "I CAN GUESS YOUR FIRST NAME."
170 PRINT "I WANT ONE CLUE ONLY."
180 PRINT "THEN ANSWER MY QUESTIONS --"
190 PRINT "Y FOR YES, N FOR NO."
200 INPUT "TAP ENTER TO CONTINUE";X
210 CLS
220 PRINT "NOW FOR THAT CLUE. ENTER"
230 INPUT "NUMBER OF LETTERS IN FIRST NAME";Z
240 IF Z<1 THEN CLS: GOTO 230
250 DIM XX(Z)
260 QQ=Z
270 IF Z>30 THEN PRINT "YOU FIB. I QUIT.": END
280 DIM N$(Z)
290 IF Z>11 THEN PRINT "I SENSE EXAGGERATION, BUT I WILL (SIGH)
TRY ANYWAY."
300 FOR A=1 TO Z
310 N$(A)="-"
320 NEXT A
330 IF LEN(A$)=0 THEN 820
340 A=RND(LEN(A$))
350 REM *** MODEL 100 FOLKS, MAKE LINE ABOVE READ: 340 A=1+INT(R
ND(1)*LEN(A$))
360 Z$=MID$(A$,A,1)
370 IF A=1 THEN A$=RIGHT$(A$,LEN(A$)-1): GOTO 400
380 IF A=LEN(A$) THEN A$=LEFT$(A$,LEN(A$)-1): GOTO 400
390 A$=LEFT$(A$,A-1)+RIGHT$(A$,LEN(A$)-A)
400 PRINT "IS LETTER * ";Z$;" * IN IT"
410 GOSUB 470
420 IF B$="Y" THEN GOSUB 500
430 IF B$="N" THEN 330
440 IF B$="Y" THEN PRINT "IS THERE ANOTHER ";Z$;" IN IT?": GOSUB
470
450 IF B$="Y" THEN GOSUB 500: GOTO 440

```

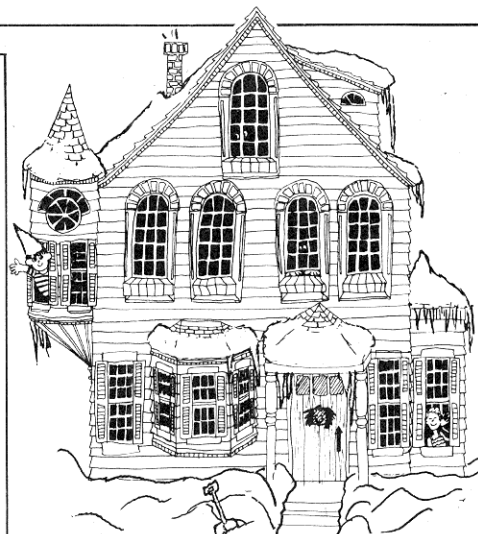
Listing continued

Listing continued

```

460 GOTO 330
470 INPUT "Y-N";B$
480 IF B$<>"Y" AND B$<>"N" THEN CLS: GOTO 470
490 RETURN
500 A=RND(Z)
510 REM *** MODEL 100 FOLKS, MAKE LINE ABOVE READ: 500 A=1+INT(R
ND(1)*Z)
520 CLS
530 IF N$(A)<>"-" OR XX(A)<>0 THEN 500
540 N$(A)=Z$
550 XX(A)=1
560 IF QO=1 THEN 690
570 PRINT "IS IT IN THE RIGHT PLACE?"
580 FOR C=1 TO Z
590 PRINT N$(C);
600 NEXT C
610 PRINT
620 GOSUB 470
630 IF B$="Y" THEN QO=QO-1: FOR V=1 TO Z: XX(V)=0: NEXT: RETURN
640 HH=HH+1
650 IF HH=QO THEN 750
660 N$(A)="-"
670 HH=0
680 GOTO 500
690 PRINT "NO DOUBT ABOUT IT. YOUR NAME"
700 PRINT "IS ";
710 FOR A=1 TO Z
720 PRINT N$(A);
730 NEXT
740 END
750 PRINT "UH-OH, YOU SAID LETTER ";N$(A)
760 PRINT "WAS IN YOUR FIRST NAME,"
770 PRINT "BUT YOU SAID NO WHEN I"
780 PRINT "TRIED ALL EMPTY SPACES."
790 PRINT
800 PRINT "LET'S TRY AGAIN FROM THE START."
810 END
820 PRINT "WHOOPS, ALL LETTERS ARE GONE"
830 PRINT "AND I HAVEN'T GUESSED. THAT"
840 PRINT "MEANS YOU, ER... SAID A LETTER"
850 PRINT "WASN'T IN OUR NAME AND IT WAS."
860 GOTO 790
870 END

```



A Week of Birthdays

"Monday's child is fair of face..." begins an old nursery rhyme. I can never remember what comes after that. Is Tuesday's child gone without a trace? a winner of the race? tied up in lace? solving the case?

I solved the problem by looking up the old poem. I did it because some people like to find out the day of the week on which they were born to determine what qualities or fate they have, based on the rhyme.

I'd say it's a bunch of hooey, except I'm a Saturday's child and I do work hard for my living, so....

Run the program, please. It asks you to give two answers. The first prompt is TYPE THE DAY OF THE WEEK. Type it out fully, using no abbreviations. Use all capital letters.

If you don't know the day of the week, ask your little brother who hates school and always knows how many days until Friday.

Next, answer the question, HOW MANY DAYS HAVE YOU LIVED? If you don't know the answer, go directly back to Days Alive and find

ber what happened on most of those days.

However, I've found that kids enjoy knowing this interesting total of their lives. I hope a lot of people with 2,000-5,000 days of experience get to try this program.

It works simply. Just do what the computer says and no harm will come to you. When you see the prompt NOW WE NEED YOUR BIRTHDATE. ENTER MONTH, DAY, YEAR SEPARATED BY COMMAS, remember that you only need the final two numbers of your birth year.

If you were born on January 16, 1972, you type 1,16,72. In this system, January is the first month of a year, and December is the twelfth month. You can

figure out the numbers for the others.

Next, the program asks you to enter today's date. If you are trying this program on New Year's Day, the answer is 1,1,84.

With that, the lightning-quick computer goes to work and tells you the number of days you've had in your life.

Days Alive only works for birthdays in the 20th century. Any Fun House reader born in the 19th century (or earlier) can send me his or her birth date. I'll figure out the total on an abacus and mail back the answer.

Remember how many days you've lived. You need that total to make the next program run.

DigitalTalker™

T1050 — Applications: Teaching aids, appliances, clocks, automotive, telecommunications, language translations, etc.

The T1050 is a standard DIGITAL KIR kit encoded with 137 separate word and phrase cards. It is used 5 different sentence durations. The words and tones have been assigned discrete addresses, making it possible to output single words or words concatenated into entire sentences. The "voice" output of the T1050 is a highly intelligible male voice. Female and children's voices can be synthesized. The vocabulary is chosen so that it is applicable to many products and markets.

The T1050 consists of a Speech Processor Kit, MM5404 (40-pin) and two (2) Speech ROMs: MM5216BSSR1 and MM5216BSSR2 (24-pin) with a Master Word List and a recommended schematic diagram on the application sheet.

T1050	Digitakal™	\$34.95 ea.
MM54104	Processor Kit	\$14.95 ea.

T1057 - Expands the T1050 vocabulary from 137 to over 260 words. Includes 2 ROMs and specs.

T1057	\$24.95 ea.
--------------	--------------------

Evaluation Kits

No.	Part	Function	Price
1	4545P1	CMOS Precision Timer	14.95
2	4545V/K1	24 Stowach Switch, XTL	19.95
3	4565CPL	3 1/2 Digit A/D (LCD Drive)	3.95
4	4565CPL/K1	3 1/2 Digit A/D Display for 106 & 7116	19.95
5	4565V/K1	IC, Croual Board, LED	11.95
6	4707CPL	3 1/2 Digit A/D (LED Drives)	21.95
7	4707CPL/K1	IC, Croual Board, LED Display	11.95
8	4707HUS	3 1/2 Digit A/D (LCD) Dr. H.D.	16.95
9	4707HUS/K1	Low Battery Vail Indicator	2.25
10	4707HUS/K1	CMOS LED Stowach/Timer	12.95
11	4707HUS/K1	24 Stowach Switch, XTL	14.95
12	4707HUS/K1	24 Stowach Switch, XTL	4.95
13	4707HUS/K1	Tone Generator Switch, XTL	7.95
14	4707HUS/K1	Oscillator Controller	5.95
15	4707HUS/K1	4 Reg. Counter Chip, XTL	7.95
16	4707HUS/K1	4 Func. CMOS Stowach OKT	13.95
17	4707HUS/K1	4 Func. Stowach Switch, XTL	14.95
18	4707HUS/K1	8 Digit Univ. Counter C.A.	29.95



INTERISIL

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	*Pins	Function		
101-108		Quad 1-Input AND-OR Gate Array (High Output)	\$3.95	
101-108		Hex 12-Input AND-OR Gate Array (High Output)	3.95	
101-108		Quad 1-Input AND-OR Gate Array (High Input)	3.95	
101-108		Quad 1-Input AND-OR Invert Gate Array (Low Output)	3.95	
101-124		Hex 12-Input AND-OR Invert Gate Array (Low Output)	3.95	
101-124		Quad 1-Input AND-OR Invert Gate Array (Low Input)	3.95	
101-124		Quad 1-Input AND-OR Invert Gate Array (High Input)	3.95	
16-168		Quad 16-Input Register AND-OR Gate Array	7.95	
16-168		Hex 16-Input Register AND-OR Gate Array	7.95	
16-168		Quad 16-Input Register AND-OR Gate Array	7.95	
10612		1982 NATIONAL PAL Data Book (176p.)	\$5.95	
74C-2/MOS				
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7106SEV/K1*	28	Stowatch Chip, XTL	3%	9.95
7106SLP	40	3% Digi LCD (LCD Drive)	1%	9.95
DE020D				19.95
7106SEV/K1*	40	IC, Circuit Board Display	1%	34.95
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7205PG/K1*	24	Stowatch Chip, XTL		14.95
7206SLP	16	Transceiver		4.95
7206SEV/K1*	16	Tone Generator Chip, XTL		7.95
7207APD	14	Oscillator Controller		7.95
7207AEV/K1*	14	Freq. Counter Chip, XTL		7.95
7217PG/K1*	24	4 Func. CMOS Stowatch CRT		13.95
7217SLP	24	4 Func. Stowatch Chip, XTL		14.95
7216AJL	28	8 Digi Freq. Counter C.A		29.95
7216JL	28	8 Digi Freq. Counter C.A		24.95
7216SDP	28	8 Digi Freq. Counter C.C		29.95
7217JL	28	4 Digi Up/Down Counter C.A		10.95
7217ASL	28	4 Digi Up/Down Counter C.C		10.95
7224PL	40	LCD 44 Dgt Up/Down Counter DRI		10.95
7226AJL	40	8 Digi Up/Down Counter		29.95
7226AEV/K1*	40	5 Function Counter Chip, XTL		74.95

Part No.	**Pins	Function	Price
PA1C0H8	20	Octal 10-Input AND-OR Gate Array (High Output)	\$3.95
PA1C2H6	20	Hex 12-input AND-OR Gate Array (High Output)	\$3.95
PA1C4H4	20	Quad 14-Input AND-OR Gate Array (High Output)	\$3.95
PA1C0R8	20	Octal 10-Input AND-OR-Invert Gate Array (Low Output)	3.95
PA1C2L6	20	Hex 12-Input AND-OR-Invert Gate Array (Low Output)	3.95
PA1C4L4	20	Quad 14-Input AND-OR-Invert Gate Array (Low Output)	3.95
PA1C6L8	20	Octal 16-Input AND-OR-Invert Gate Array	7.95
PA1C6R8	20	Octal 16-Input Register AND-OR Gate Array	7.95
PA1C6R6	20	Hex 16-Input Register AND-OR Gate Array	7.95
PA1C6R4	20	Quad 16-Input Register AND-OR Gate Array	7.95
20012 1982 NATIONAL PAL Data Book (756)			\$5.05

74C08	14	35	74C107	14	89	74C373	20	2 49
74C10	14	35	74C151	16	2 49	74C374	20	2 49
74C14	14	39	74C154	24	3 49	74C901	14	3 9
74C20	14	33	74C157	16	2 25	74C903	14	3 9
74C22	14	33	74C158	16	2 25	74C906	14	3 9
74C32	14	39	74C161	16	1 19	74C911	28	8 85
74C42	16	1 39	74C162	16	1 19	74C912	28	8 85
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74C85	16	1 95	74C174	16	1 19	74C923	20	4 95
74C86	14	39	74C175	16	1 19	74C925	20	4 95
74C89	16	5 95	74C192	16	1 19	74C926	16	1 19
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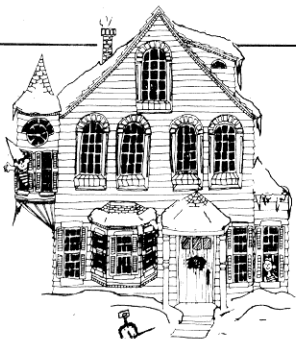
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L0810C	8	59	LM3407-12	79	LM741C	8	35	
TL082CP	8	119	LM3407-15	79	LM747N	14	69	
LM3010A	14	95	LM3470	14	LM750N	14	69	
LM3012CN	8	95	LM348N	14	LM3130N	14	59	
LM3024	195		LM350K	9	LM1458CN	8	149	
LM3024A	195		LM355	8	LM1488N	14	89	
LM3054	95		LF355N	8	LM1489N	14	89	
LM3054A	95		LM370N	14	440	14	195	
LM3062CN	8	69	LM373N	14	95	LM1800N	14	249
LM309K	125		LM377N	14	135	LM1871N	25	95
LM310CN	8	175	LM380N	8	89	LM1872N	18	325
LM311CN	8	69	LM381N	14	79	LM1877N-5	14	249
LM312CN	245		LM382N	14	139	LM1878N	14	25
LM317T	119		LM384N	14	79	LM1896N	14	255
LM317K	395		LM396N-3	8	89	LM2002T	25	95
LM318CN	8	195	LM396N	8	195	LM3189N	16	159
LM319N	14	95	TL46CP	8	119	LM3900N	14	59
LM3200N	14	35	NE530	14	295	LM3901N	14	95
LM320K-12	135		NE544N	14	295	LM3909N	8	95
LM320K-15	135		NE550A	14	95	LM3914N	8	295
LM320T-5	89		NE555	8	295	LM3915N	18	295
LM320T-10	89		NE555A	14	69	LM3916N	14	295
LM320T-15	89		NE560N	14	295	RC4130N	14	295
LM323K	595		LM565A	14	119	RC4151NB	8	195
LM324N	14	95	LM566CN	8	149	RC41947K	14	49
LM337J	195		LM567	8	99	NE5532	8	249
LM337N	695		LM570N	8	119	LM5534	8	95
LM340K-5	135		LM703CN	8	199	CLB3803	8	395
LM340K-12	135		LM709N	14	139	LM1308N	8	119
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out. And in the future don't read so fast!

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interest until it guesses your name. In return, you must truthfully answer its yes or no questions and be patient with it.

The program works with a series of prompts. You answer each one and tap the enter key.

The program first asks you to enter the number of letters in the name it will guess. It gets huffy if you claim that your first name has more than 30 letters in it.

At this point, the program starts trying out letters and asking if each is in your name. If you answer yes to this, the computer shows a row of dashes representing the unknown letters in the name and tries the letter in different positions.

When a letter is in the right place, answer yes. Example:

Your name is Carl. The computer asks, IS LETTER *R* IN IT? You answer yes.

The computer then asks, IS IT IN THE RIGHT PLACE? and displays this: --R-. The R is in the right position, so Carl answers yes. Ruth, of course, would say no. And so it goes until the computer succeeds.

Sometimes I wonder how that rascally computer does it! ■

If you have trouble making any Fun House program work, write me with your problem, sending a listing of the program as it is in your computer or a note telling me the error messages you get and what seems to be wrong. Enclose a self-addressed envelope with a 20-cent stamp, or with coin of your nation equal to the stamps on the outgoing letter. Send all this to me, Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926.

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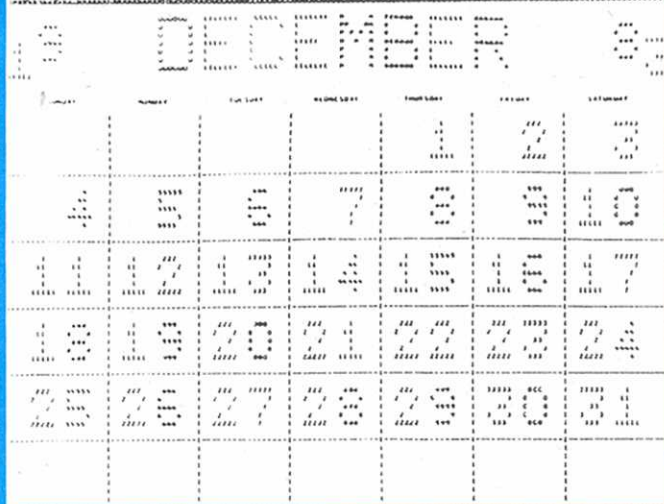
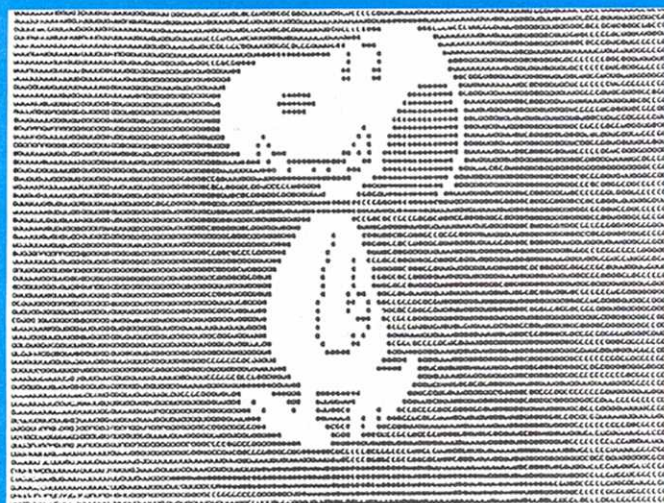
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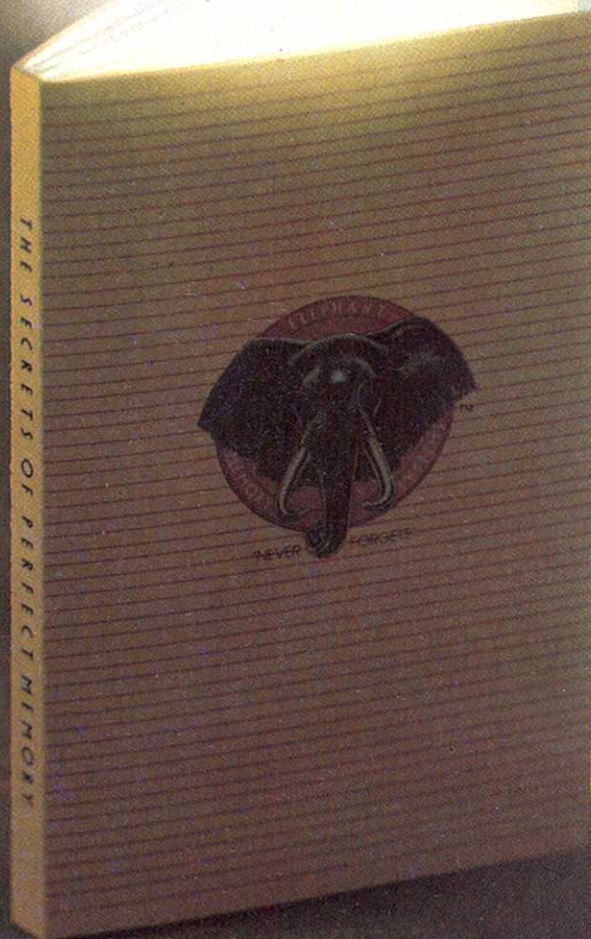
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The Mercedes project

Never disable Break," Mercedes was saying. "The whole point of *WarGames* is that you should never disable Break."

Max and I were standing in the back of Kresge Auditorium on the MIT campus, crowded among the people auditing Mercedes' class in freshman Basic. First-term teaching fellows don't usually attract 450 students.

"Amazing. I thought I knew all about the Print statement," Bill Gates said beside me.

"She didn't just correct my homework assignment. She wrote a whole multi-tasking window routine in the margin," Scott Adams murmured. Ten guys in IBM blue suits nodded attentively behind him, and Steve Wozniak was about to say something when there was a mad scramble to see what Mercedes was writing on the chalkboard.

After class, we dragged Mercedes away from her pupils—"Geez, correcting papers," she sighed. "It's worse than judging the one-line contest"—and had lunch at Quincy Market. Max keeps getting turned down for a Visa card, but I had some money left over from our visit to Peterborough.

"So how's everyone at *80 Micro*?" Mercedes asked with her mouth full. Pizza, lemonade, and chocolate chip cookies. What a combination.

"The editors are putting entries on the Big Board," I said. "Amy Campbell for Fury, and Rob Mitchell for Arex."

"Pencil pushers," Max muttered. "I could beat them."

"And they don't have the copy of Deathmaze we thought they had," I continued. "What are we going to do about all these letters asking for help?"

"How do I get to level 5? I've been known to mutter 'Inverted telephone' in my sleep! I'm going crazy!" Mercedes read. "Bill McGrath, Philadelphia, PA."

"And we've got letters about Asylum II and some other adventures," I said.

"Ask readers who've solved them to write in and become Gamer's Cafe consultants," Mercedes suggested. "You guys are going to need a data base you can call on."

"Helping adventurers," Max grouched. "I'm against the whole idea."

"Did you ever find the safe in Deadline, Max?" Mercedes asked sweetly.

Max snarled and bit into his pizza.

"You know, I missed you guys," Mercedes said.

Back at MIT, Mercedes led us past seven security checks and into the basement of the Lincoln Laboratory. "This Ph.D. project is really neat," she beamed. "The only time I ever got to try any hardware work with you guys was changing a tire."

"What exactly are you doing?" I asked, looking askance at what appeared to be a graphite pile. "Your postcard said you'd borrowed a Model 4 from your dad's Radio Shack dealership."

"It's just an upgrade," she said, punching a combination on buttons beside a vault door. "The professors here liked it when I started doing 80-column software stuff with SilverDOS 6.66, and we started talking about whether 8-bit machines were obsolete and what you could do with a Z80A-based system—"

Here Max and I stopped to gape at the object in the middle of the room ahead, even as Mercedes nimbly stepped over the three-foot-diameter cables attached to it. We'd never seen a Model 4 vibrating and hovering a few inches above the table.

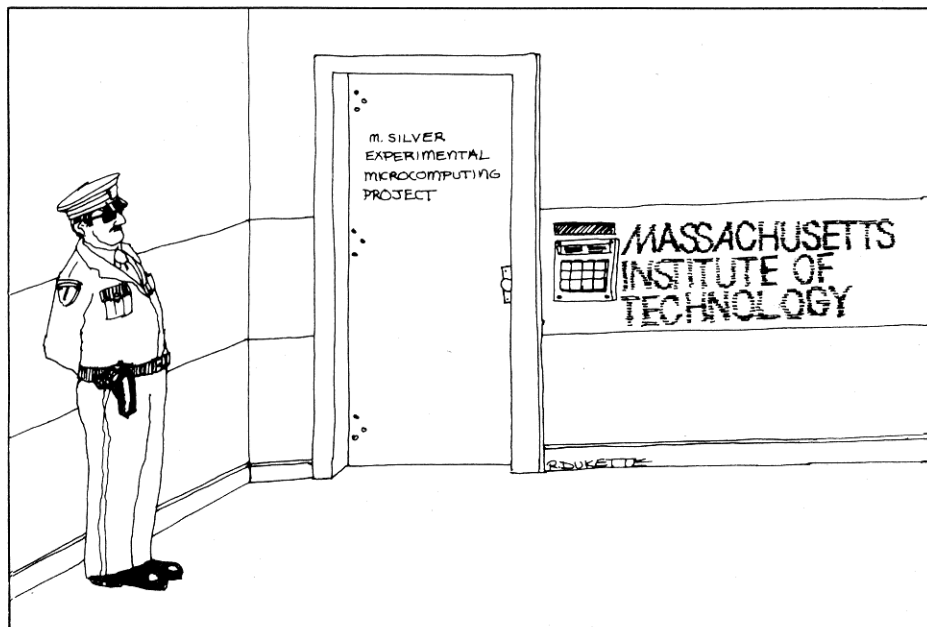
"—so a bunch of us started working on the Mercedes Mach 4," she continued. "Don't touch anything, will you?"

"A 3,000 MHz clock speed," I mumbled.

"Yeah, but it doesn't have a Model III mode," Max pointed out. "Wouldn't boot my Bable Terror disk."

"CRAM," I recalled. "Catalytic Random Atomic Memory."

"Wouldn't give back my Bable Ter-





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ror disk, either," Max continued. "Nothing left but the write-protect tab."

"One duodecagigabyte," I said dazedly.

"Shall we look at the mail? Max Marble of Chantilly, VA, writes 'I am not, I repeat, not any relation to Mad Max.' That Cousin Marble. Always such a kiddler."

Mercedes had gone off for a meeting with her advisor, and Max was trying to talk me out of my stupor over the Mach 4.

"Everything's expensive in Brisbane, Australia," he read. "Mike Bach says that a Model 100 without modem is \$1,099 and a copy of 80 Micro is \$6.70. No wonder Alan Bond spent so much to win the America's Cup."

"Just an upgrade," I repeated. "It's just an upgrade."

"Speaking of which, here's an upgrade to Defense Command from Paul Jacoby of Burnsville, MN," Max

*"That Cousin
Marble. Always
such a
kiddler."*

noted. "You load the game—I guess he has the tape version—and respond to the second *? with /6681. Then, from

Ready, you enter FOR P=28000 TO 28090: POKE P,129: NEXT: SYSTEM and press enter. Respond to the *? prompt with /18750 and you're back in the game.

"This changes the aliens," he read. "Except for the ones that look like T-shirts, they become long rods that reach about halfway down the screen. You have to shoot either straight up the center of the rod or just to the right of it, and be careful not to get between two aliens going opposite directions. And don't stay directly under the Evil Flagship when you hit it.

"Paul says you can replace the 129 with 130 or 131, or, 'for masochists only,' 128," Max finished.

* * * * *

"That 128 is for masochists only," I

The Big Board

Alien Cresta	6,913	Mike Bach, Brisbane, Australia	Laser Defense	1,504,610	Greg Samson, Loudonville, NY
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Crazy Painter	1,087,000	Mike Beebe, Sacramento, CA	Rear Guard	195,240	John Hope, Kingston, Ont.
Cyborg	317,000	Robert Cavin, Laredo, TX	Robot Attack	143,250	Mark Fertig, Northville, MI
Danger in Orbit	69,640	Steve Sustacek, Danube, MN	Sea Dragon	610,180*	Robert Fitzwilliam, Houston, TX
Defense Command	128,230	Bette Dufraigne, Bolton, CT	Sky Sweep	1,000,540	Tommy Seniuk, Vegreville, Alta.
Demise/Defend	165,000	David Russell, Ardrossan, Scotland	Space Castle	69,750	Rick Sayre, Stockton, CA
Demon Seed	103,160	Markus Blum, Ludwigshafen, W. Germany	Space Intruders	14,030	Ron Johnstone, Emporia, KS
Desert Peril	84,400	Jay McLain, Clatskanie, OR	Space Warp (Level 8)	261	Jer McLanahan, New Canaan, CT
Devil's Tower	25,700	Rick Sayre, Stockton, CA	Star Blazer	52,750	Mark Adams, Tampa, FL
Dungeon Escape	6,531	Donald Tindall, Littleton, CO	Stellar Escort	625,000	Kevin Josephson, Chilliwack, B.C.
Firebird	46,400	Mike Bach, Brisbane, Australia	Super Nova	2,138,710	Mark Fertig, Northville, MI
Flying Saucers	2,186	Stuart Lory, Victoria, B.C.	Swamp Wars	59,130	Farhad Abrishami, Silver Spring, MD
Fortress	515,925	Greg Samson, Loudonville, NY	Temple of Apshai	390	Carl Pflanzner, Gillette, NJ
Frogger	400,900	Shawn Roberts, Oklahoma City, OK	Time Bandit	14,460	Mark Adams, Tampa, FL
Fury	46,120	Amy Campbell, Peterborough, NH	Time Runner	89,479	Mad Max
Galactic Empire	2,010	Mike Bach, Brisbane, Australia	Venture	58,550	Darren Cotter, Oceanside, CA
Galaxy Invasion Plus	3,000,000	Shawn Lipman, Nelspruit, S. Africa	Voyager 1	833	Farhad Abrishami, Silver Spring, MD
Gauntlet	58,360	David Schwartz, San Jose, CA	Weerd	61,180	Tommy Seniuk, Vegreville, Alta.
Ghost Hunter	43,190	Lance Smith, Auckland, N.Z.	Wild West	33,220	Mike Bach, Brisbane, Australia
Gobbleman	64,310	Mike Bach, Brisbane, Australia			
Hamburger Sam	34,300	Mark Adams, Tampa, FL			
Hoppy	70,381	Mike Bach, Brisbane, Australia			
Insect Frenzy	691,156	Tommy Seniuk, Vegreville, Alta.			
Invaders from Space	655,360	Darren Cotter, Oceanside, CA			
Jovian	148,300	Greg Samson, Loudonville, NY			
Jungle Boy	851,900	Zagros Sadjadi, Petaluma, CA			
Killer Gorilla	28,312	Alex Poon, Baton Rouge, LA			
Laserball	72,530	Neil Matson, Panama City, FL			

*Expert mode: 339,080 (David Smith, Kingwood, TX).

Gamer's Cafe readers are invited to submit their high scores, preferably with screen photos, for these and other Model I/III/4 games. Sorry, but we are no longer accepting entries for Color Computer games and, due to known bugs or ridiculously high scores, the following: Alien Defense, Armored Patrol, Bounceoids, Dig Out, Eliminator, Galaxy Invasion, Liberator, Paddle Pinball, Scarfman, Skyscraper, and Strike Force.

muttered, pulling the van off Route 128 ("America's Technology Highway") and looking for another place to park the Cafe. We'd done brisk business in the Wang Laboratories parking lot at lunch hour, but some security guy had chased us away into the traffic. Four lanes of people looking for a Burger King.

It was our second day in Boston; Mercedes had canceled her office hours and we were discussing our immediate future.

"I think you should hang around here for a while," she said. "I'm supposed to teach Assembly language next and do a couple of graduate seminars, and I have to stay and work on the Mach 4. The physics and engineering departments are going to help with the storage."

"What do you have in there, anyway?" I asked. "Double-density drives? Quad-density drives?"

"My advisor calls them 'warp drives,'" Mercedes shrugged.

"I can imagine," Max said. "Denser than a black hole."

"Don't be ridiculous," Mercedes said. "A light gray hole, maybe. The lab says they should cause only minor sidereal effects in the immediate vicinity of the machine—"

"Getting back to business," I said, "we probably should wait a while before going on the road again. Give players one more month to write us before we take all those games with scores people say are impossible off the Big Board. Cosmic Fighter, Penetrator, Missile Attack, Space Warp, Venture."

"Do you know how to get off Storrow Drive, Rodney?" Mercedes asked. "We've gone under the Arthur Fiedler Footbridge four times."

At that moment, the radio went dead and I jammed on the brakes as a traffic light ahead turned blank. Within seconds, horns were honking and people were leaning out of apartment windows, shouting "Another blackout!"

"Geez!" Mercedes smacked her seat angrily. "This is the second time they've booted the Mach 4 without my being there. I've told them we won't have enough power until we launch Silversat and get the solar panels working. And the microwave transmitter—"

"I think we should stay in Boston for a little while," Max told me.

"I'm not sure it'll be safe," I said. ■

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It's a Load 80 year

January, the start of a new year; the Romans symbolized it with the two-faced god, Janus. He looks forward and backward simultaneously, and epitomizes my feelings at this time of year. It is a time to reevaluate the past, then plan for the future.

Looking over my Load 80 collection for 1983, I realize what a blockbuster year it was. From psychological testing tools to stock market analysis programs, we've run them all.

An overview of the highlights has to include the TRS-80 version of Turtle Graphics that ran in February (TURTLE/BAS). This teaching tool lets the youngest of programmers draw on the screen, save his creation, and recall it later.

March was something to roar about—not only did we have the data base management program that won our Reader's Choice Award (AIDS III/BAS), we also featured a LISP compiler (LISP/BAS) that lets you explore this exciting language. (LISP is currently the language of choice among Artificial Intelligence researchers.)

April rounded out your data base manager with subsystems for sorting (MERGE3/BAS), formatting and

printing (MAPS3/BAS), and calculating (CALCS3/BAS). And let me remind you about MINICALC/BAS, the spreadsheet program we ran in May.

August was fun and games. Arcade-type games, adventure games, two-player games, and solitaire games; any way you like to play it, Load 80 had it.

But in September, we got back down to business. Featured that month was a communications terminal package for your Model III/4. The six programs comprising UTERM make your micro a terminal for talking to the big data bases.

But enough, you know what you liked this year. My goal was always (and continues to be) to put together a product containing the most interesting, most functional, and most fun programs run in each month's *80 Micro*. I hope you enjoyed them.

Welcome to New Subscribers

Load 80 cassettes and disks are not like any other software you can buy because they contain a wider variety of programs. But all the programs do not

necessarily run on your computer. The popularity of the TRS-80 encouraged us to make Load 80 support over a half dozen disk operating systems (DOSes), a gaggle of editor/assemblers, and three models of computer (I, III, and 4). This means I can't put together a ready-to-run product (though I try).

You must determine, by reading the Key Box that accompanies each article, whether the program is appropriate for your machine. Sometimes a little manipulation will make a program run on your system. I try to inform you of these changes in my column. In the coming months, I'll try to cover the hows and whys of converting programs from one machine to another.

Before you decide that a program doesn't work, read the article thoroughly. Because our programs are written by our readers, the error-trapping routines aren't always as sophisticated as those in commercial programs. If this is the case, the article tells you how to avoid crashing the program. If you have serious problems, call or write me (if you include your phone number, I'll call you).

We Aim to Please

I am constantly looking for ways to make our product serve you better. Changes this past year include better documentation, a new transfer utility for Load 80 disks, and supplying our machine-language programs in assembled, ready-to-run format. Sometimes, I'm limited in what I can do by the software I have available. For instance, source code provided to me from an EDTASM Disk editor/assembler can't be written to tape. If you're inconvenienced by this, write to me and I'll try to make some special arrangement.

Plans for the future? The title program that appears each month will expand to include information about the programs, instead of just the copyright. Of course, we'll keep abreast of the TRS-80 market, and you may see some changes in our documentation. And as always, we want to provide our subscribers with the best software and support possible. ■

Article	Page	Cassette File Spec	Disk File Spec	Comments
Side A				
Touch or Sound Typer	88	A	TITLE/BAS	Basic
Dot Talk	94	B	TOSTYPER/BAS	Basic
The Taxman Cometh	100	C	BRATTLE/BAS	Basic
Tape It Easy	112	D	TAXMAN/BAS	Basic
Tape It Easy	112	E	DATAPE/BAS	Basic
Tape It Easy	112	F	TAPE16/BAS	Basic
Side B				
Tape It Easy	112	G	TAPE32/BAS	Basic
Tape It Easy	112	H	TAPE48/BAS	Basic
Synthetically Speaking— Part I	142	I	LIST1/BAS	Basic
The Bucks Start Here	160	J	BUCKS/BAS	Basic

January 1984 Load 80 directory.



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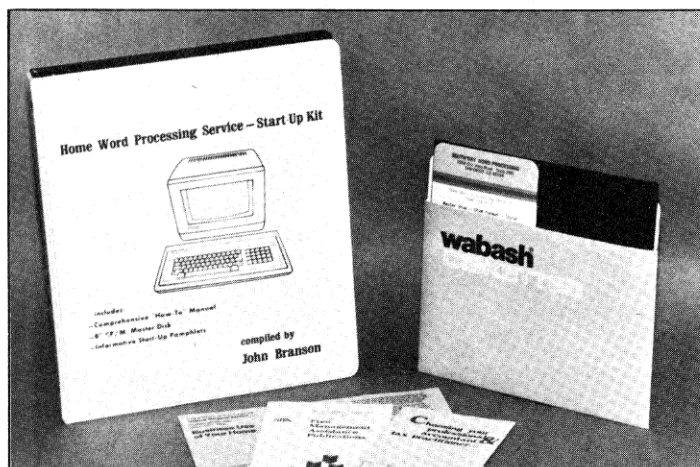
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Logical Upgrade

The Norcom TC-III is a new replacement logic board assembly for the Model I that provides you with full Model III performance. It features dual-density floppy disk controller, 48K RAM, optional on-board RS-232, parallel printer port, and dual speed cassette I/O. It also has reverse video character set, on-board audio driver for a speaker, and high readability character font.

All known software and accessories for the Model III will run on the TC-III, including machine-language programs. And all cassette, disk, printer, and I/O bus connectors match those on the Model III. The Norcom TC-III costs \$399 and requires installation. The RS-232 option, fully assembled, costs \$50. Both are sold by Northern Technology Corporation, 2350 Brickvale Drive, Elk Grove, IL 60007, 312-860-1772.

Reader Service ✓ 565

Dual Processor Option

The 8088 Dual Processor Option (DPO) is a 16-bit CPU board for your Model II, 12, or 16. It lets you run MS-DOS, CP/M-86, CP/M Plus, Xenix, CP/M 2.2, RM/COS, MP/M II, and Concurrent CP/M-86 on your computer system.

The DPO card contains an Intel 8088 microprocessor for its CPU. The 8088 provides the 16-bit addressing capability, processing power and instruction set of the 8086 while supporting the I/O requirements of the 8-bit bus architecture found in your TRS-80.

Although the DPO card by itself is a single processor unit, when installed in your TRS-80, the combination of this card and the existing Z80

CPU results in a dual processor environment.

The standard 8088 DPO comes with 128K of RAM that you can upgrade to 256K. The DPO resides in one slot in your TRS-80 motherboard and coexists with the resident Z80 board. It can also coexist with Radio Shack's optional high resolution graphics and MC68000 upgrade boards.

Prices range from \$999 for a 5 MHz DPO board with 128K RAM to \$1,649 for an 8 MHz DPO board with 256K RAM. Support for the Radio Shack 8 Megabyte and 12 Megabyte hard disks, including a back-up/restore utility program, is an available option. For further information, contact Veritas Technology Inc., 2375 Zanker Road, Suite 245, San Jose, CA 95131, 408-263-0646.

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File Scrambler

Protect your financial projections, R&D reports, and bidding proposals from prying eyes with Super Encryptor, a file scrambling program that operates under MS-DOS and CP/M. The program makes your user files unreadable to anyone

without the correct password. Several levels of security are available, with the highest level requiring from an expert programmer hours of mainframe computer time to have even a chance at cracking the password.

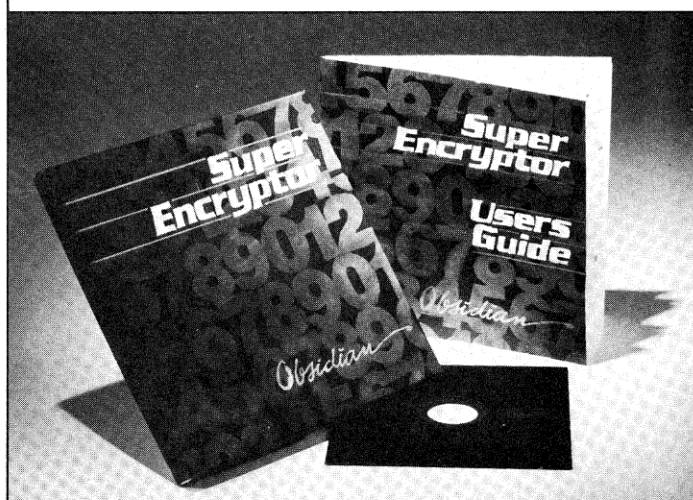
Super Encryptor retails for \$49.95 from Obsidian Computer Systems, 236 North Santa Cruz Ave., Suite 243, Los Gatos, CA 95030, 408-395-7900.

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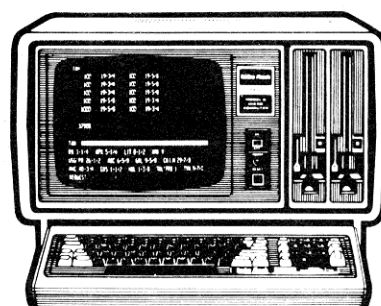
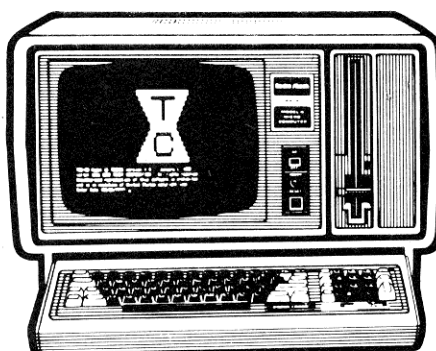
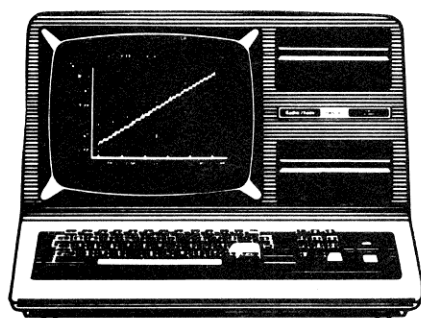
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useful algorithms in minimal Basic, including four ways to sort. Each entry includes the algorithm's function, advantages, speed, and method of operation.

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These reference cards cost \$5.95 each plus \$1 for postage from Micro Logic Corp., P.O. Box 174, 100 Second St., Hackensack, NJ 07602, 201-342-6518.

Reader Service ✓ 564

Say What?

Demystify your child's computer jargon, or pick up a few new phrases yourself with the *User's Guide to Microcomputer Buzzwords* by David H. Dasenbrock. This book is written for people

who don't necessarily care what happens inside a computer, but who want to be able to communicate with people who do.

This guide gives you the origins and meanings of hundreds of computer terms. Dasenbrock covers everything from "abort" to "Z80" in clear, concise language accompanied by photos, line drawings and charts.

This illustrated guide sells for \$9.95 from Howard W. Sams & Co. Inc., 4300 West 62nd St., Indianapolis, IN 46268, 317-298-5400.

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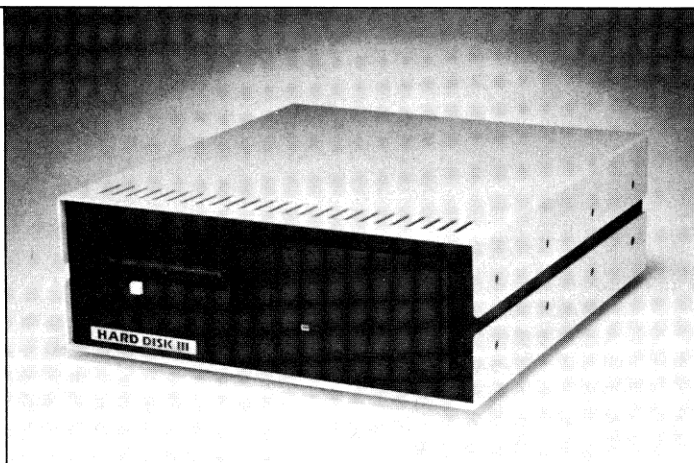
be unscrambled with the same keys that scrambled them in the first place. For extra protection, you can encrypt a file more than once.

Encryption is useful when you send private files by electronic mail. And it is far better than using passwords. Secure costs \$49.95 and is available from computer dealers nationwide. For the name of your local dealer, contact Word-movers Inc., 15818 Hawthorne Blvd., Lawndale, CA 90260, 213-542-7351.

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Hard Disk III

The VR Data Hard Disk III is a 5¼-inch Winchester disk subsystem that's compatible with your Model I, III, or 4. It is available in



VR Data's Hard Disk III: a powerful subsystem for your computer.

single- or dual-drive configurations, and provides you with storage capabilities of 5 to 30 or more megabytes.

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computer with a high level command set (e.g., read sector, write sector, format drive, etc.). Its power supply runs on 50 or 60 Hz and is jumper selectable for 115- or 230-volt operation.

The vital statistics of the

Hard Disk III 5 Mbyte system include 345/435 TPI, 3,600 rpm, 612 tracks, 3 microsecond track-to-track access time, 8.3 microsecond average latency, 15 microsecond head settling, and 8,000 hours mean time between failure. It measures 14 inches wide by 15 inches deep by 5½ inches high.

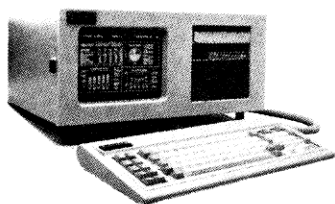
Prices start at \$995 for the 5 Mbyte subsystem, including case, power supply, cables, and mounting hardware fully assembled, tested, and burned in. For further information, contact VR Data, 777 Henderson Blvd., Folcroft, PA 19032, 800-345-8102, 215-461-5300. Adapters, which include all hardware and software to run your TRS-80, are priced at \$150 and up.

Reader Service ✓ 576

Continued on p. 242

COOSOL COMPUTER PRODUCTS

COLUMBIA DATA MPC



- COLUMBIA System Includes: IBM COMPATIBLE Dual Floppies, 128K RAM, Two RS-232 Serial ports, Centronic Printer port, IBM Compatible Keyboard, Hi-Res Color Graphics Card, Green or Amber Monitor and more with \$3,000 Software bundle.

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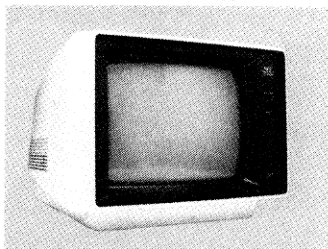
OTHER COMPUTERS

- EAGLE II Business Computer CALL
- EAGLE III Business Computer CALL
- EAGLE IV Business Computer CALL
- EAGLE 1630 Computer CALL
- ALL EAGLE CPUs Includes Software Bundles
- NEC PC-8001A, PC-8012A, PC-8031A, JB-1201, PC-8023 w/Software... \$1995
- (NEC SYSTEM) \$1995
- NEC PC-8800 8-BIT or 16-BIT w/Software CALL
- NEC APC SYSTEM 16 bit CALL
- SANYO MBC-1000 with Bundled Software \$1595
- SANYO MPC-3000 with Bundled Software CALL
- SANYO-NEW PC CALL

SOFTWARE

- STONEWARE CALL
- SUB LOGIC—FLIGHT SIMULATOR ... \$33
- VISI CORP—VISICALC \$239
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- LOTUS CALL
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- HAYES SMARTMODEM (300 & 1200) CALL
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- NOVATION J-CAT \$120
- NOVATION 212 AUTO-CAT CALL
- SIGNALMAN MARK I and others CALL
- U.D.S. Series Modems CALL

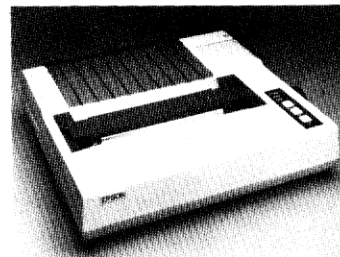
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- AMDEK RGB COLOR II INTERFACE . \$169
- M&R ENTERPRISES RGB INTERFACE \$69
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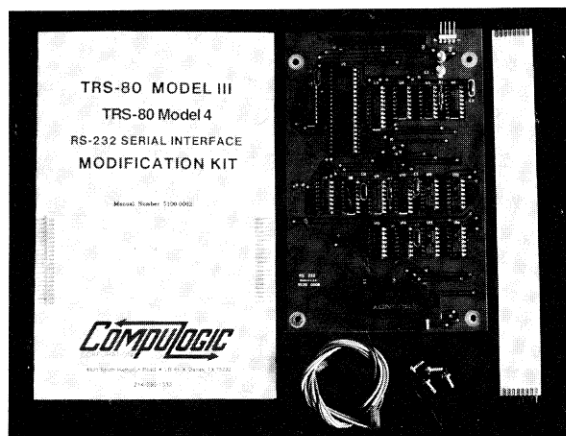
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105

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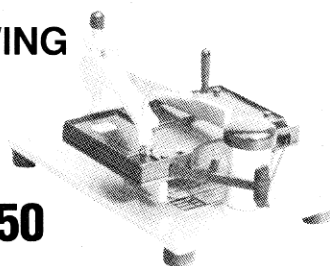
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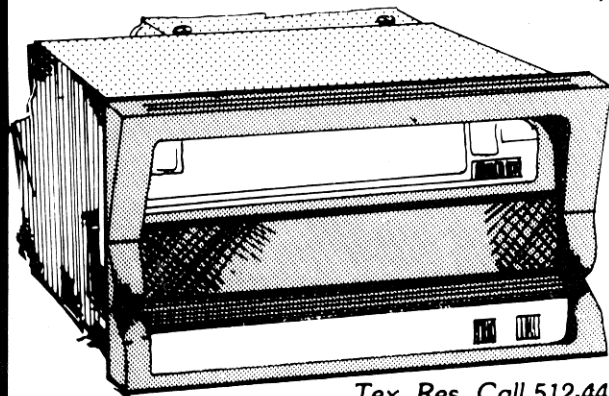
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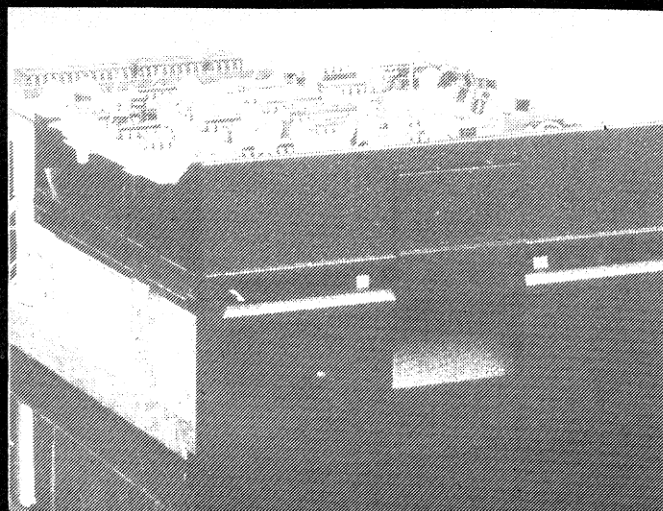
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NEW PRODUCTS

Continued from p. 238

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Model 4 owners will be pleased to learn that the Peachtree Series 4 accounting software is now available for your system. It consists of a General Ledger, Accounts Payable, and Accounts Receivable.

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The Peachtree Series 4 package costs \$495 for the floppy disk version and \$595 for the hard disk version, both from Compu-Systems Software, 212 Skylark Court, Norman, OK 73069, 405-377-8570.

Reader Service ✓ 580

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subroutines, and specification sheets for each subroutine. Each sheet contains instructions for use, examples, and restriction.

Reader Service ✓ 559

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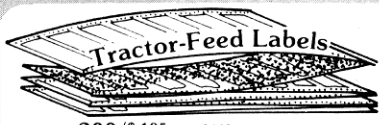
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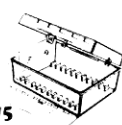
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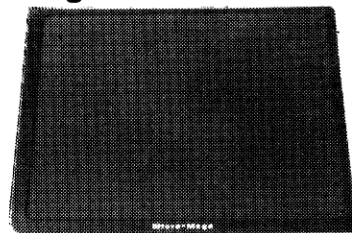
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Reader Service ✓ 563

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marked with respect to each pin's function. The labels cost \$13 for a pack of 10.

Reader Service ✓ 557

Inside Super Utility Plus

There's no need to second guess how to properly use Super Utility Plus 3.0 anymore, now that *Inside Super Utility Plus Series 3.0* is available. This guide delves into the intricacies of Super Utility Plus written from the viewpoint of a user, Paul Wiener.

The book describes many of the things that may not be immediately clear to you, explains why you might want to do certain things with Super Utility Plus, how to do them, and details a step-by-step procedure for rescuing disks. There is also a special section for handling various kinds of NEWDOS80 problems as well.

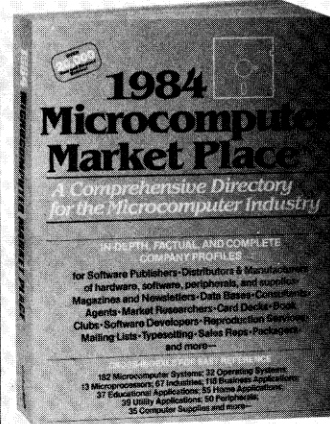
Inside Super Utility Plus does not replace the user's manual, but rather expands on it. It sells for \$19.95 from Powersoft Products, 11500 Stemmons Expressway, Suite 125, Dallas, TX 75229, 214-484-2976.

Reader Service ✓ 560

Anything and Everything

You can have the entire computer market in your hand with *The Microcomputer Market Place* from Dekotek. This comprehensive directory contains in-depth company profiles of over 2,000 software publishers; 175 distributors; 100 data base publishers; 750 manufacturers of systems, peripherals, and supplies; and 400 specialty listings that include consultants, agents, market research companies, duplicating services, and more.

Cross-Indexes give easy reference to microcomputers, peripherals, micropro-



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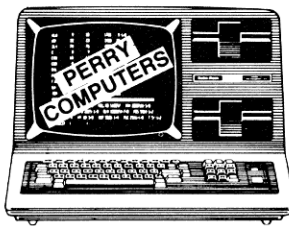
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cessors, operating systems, and computer supplies. The indexes also let you locate software companies by application areas, and, as a bonus, a month-by-month calendar of 165 industry meetings and exhibits is listed with relevant information.

The 1984 Microcomputer Market Place costs \$75 per copy from Dekotek Inc., 2248 Broadway, New York, NY 10024, 212-799-6602.

Reader Service ✓ 569

verse video. The manufacturer compressed the system code to occupy only the first two tracks of the disk, leaving 170K for data storage.

The CP/M 2.2 operating system costs \$199 complete with all utilities and a 300-page user's manual from Montezuma Micro, Redbird Airport Hangar #8, Dallas, TX 75232, 800-527-0347 (US), 800-442-1310 (TX).

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Model 4 CP/M

Model 4 owners, relax. CP/M 2.2 is now available for your microcomputer. This operating system requires either 64K or 128K of RAM, and features a configuration program for 35-, 40-, 77-, and 80-track single- or double-sided drives and a Format utility that builds over 52 different disk formats. One special feature of interest is an Interchange utility that reads, writes, or copies over 20 popular disk formats including IBM, Kaypro, Osborne, and Xerox.

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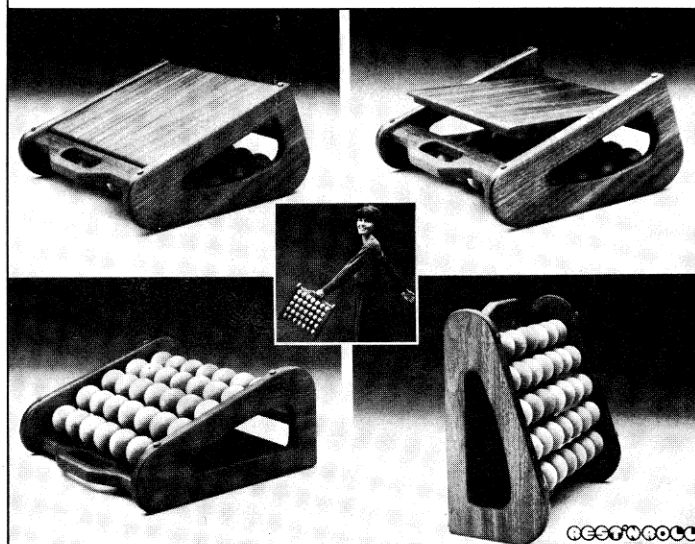
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If you currently use LDOS 6.0, you'll be pleased to learn that its principal author has written *The Programmer's Guide to LDOS/TRSDOS Version 6*. This 214-page book answers all your questions about LDOS. Topics discussed include disk drive input/output interfacing, the DOS directory structure, disk file access and control, an operating system overview, device input/output interfacing, and interfacing via supervisory calls.

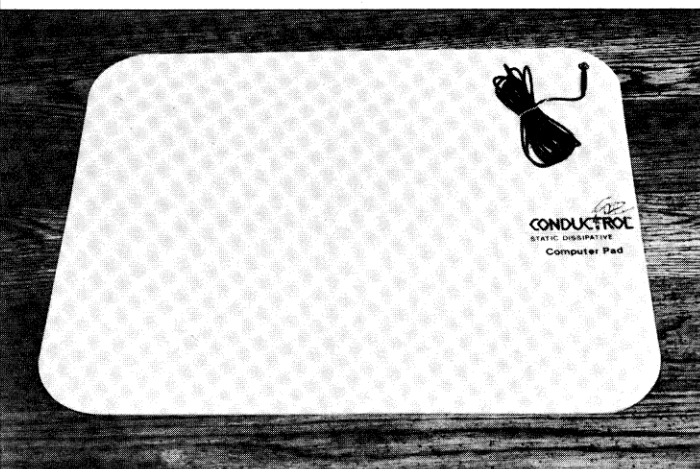
The appendix covers topics such as memory bank switching, system disk boot track, disk load module format,

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costs \$20 plus \$1 shipping from Misosys, P.O. Box 4848, Alexandria, VA 22303, 703-960-2998 (9 a.m.-6 p.m. M-F).

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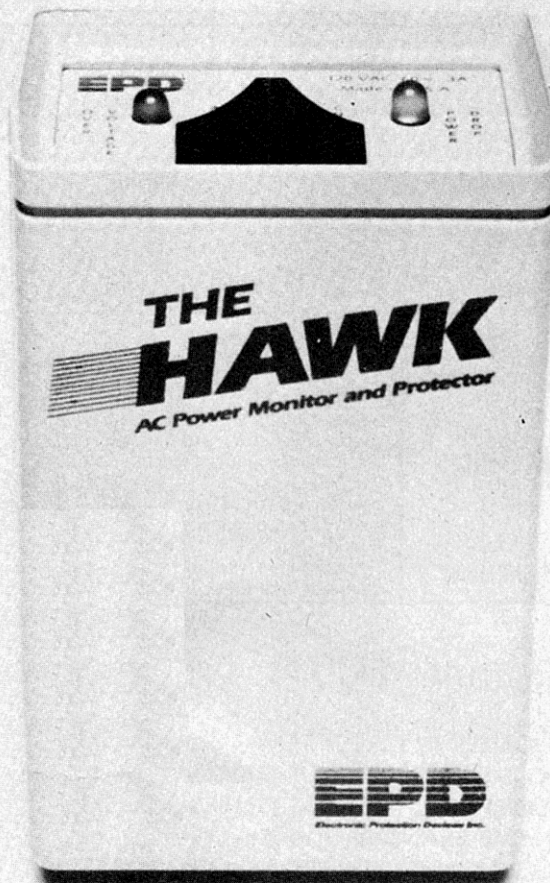
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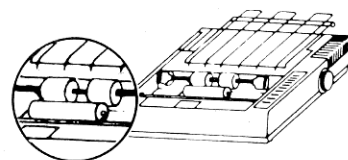
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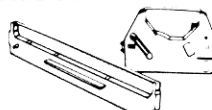
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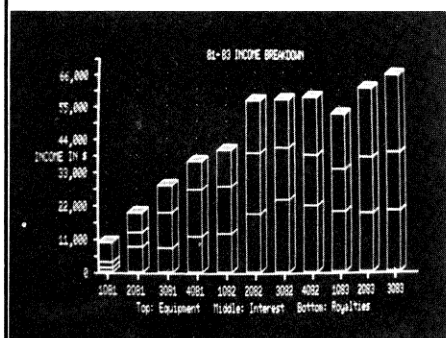


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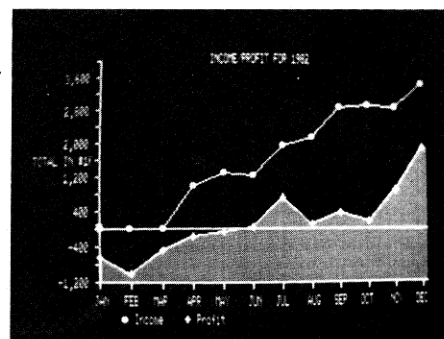


Powerful Graphics. BIZGRAPH is a self-prompting business graphing program designed to work exclusively with Grafyx Solution. Micro-Labs' Grafyx Solution is a plug-in, clip on board which gives you 98,304 points in a 512 x 192 matrix. That's sixteen times as many points as a standard Model III! Improve your business with clear, accurate graphs. Perfect for managers, small businessmen and analysts. The BIZGRAPH package can display Line Graph,

Bar Chart, Pie Chart, Area Plot, Histogram Plot, and Scatter Plot. Data can be entered from the keyboard or disk files - including VisiCalc.

Quality Grafyx. Select graph type, enter data or file name, select options, and a graph is quickly displayed in amazingly fine detail. Multiple data sets can be combined on one graph. Another unique feature is the ability to display the hi-res screen along with the normal text and low-res screen.

Versatile Grafyx. BIZGRAPH is a flexible program providing automatic



labeling of X and Y axis points using 85 characters/line. Forecasting future trends is possible using line fitting, quadratic, and third order linear regression analysis. Data smoothing using moving averages is also possible. The finished graph can be saved on disk or printed on any of 20 popular printers.

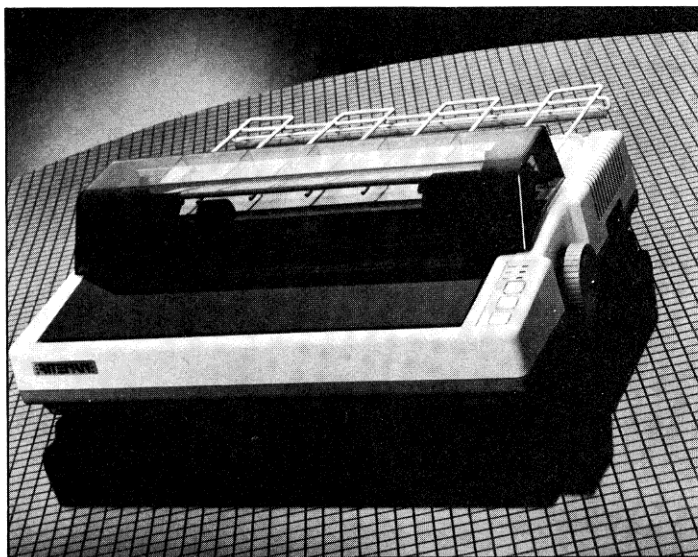
The Grafyx Solution package is shipped from stock and includes the board, 44 programs, and a 54 page manual all for \$299.95. The BIZGRAPH program, sample graphs, and manual is \$98. Shipping is free on pre-paid or COD orders. (Tx. res. add 5% sales tax.)

*VisiCalc Registered TM VisiCorp



MICRO-LABS, INC. 214-235-0915
902 Pinecrest, Richardson, Texas 75080

✓ 464



Take it with you: the Riteman printer with standard tractor feed and cover.

tection Devices Inc., 217 Bear Hill Road, PO Box 673, Walham, MA 02254, 617-891-6602, 800-343-1813.

Reader Service ✓ 570

Look to the Stars

The Greeks and Romans used to look to the stars for guidance and revelations. Ancient mariners depended on the stars for navigation. Now you, too, can look to the stars for fun and recreation with help from the Astronomy Pac. This program enables you to identify and locate any star or constellation in the night sky.

The Astronomy Pac generates its own almanac data

and contains detailed information on 58 of the most prominent stars. This lets you print the location of these stars for any time until the year 2000 from any location on earth. Astronomy Pac's star identification program determines the star and constellation you should observe after you enter the time, date, your approximate position, and the star's height and azimuth.

This astronomy program comes complete with software, instructions, astrolab, compass, and H.A. Rey's book, *The Stars*. It is ideal for both beginner and advanced astronomer. The Astronomy Pac costs \$59.95 for

Model I, III, or 4 cassette, and is sold by Celestial Software, 3010 Warrington Ave., Lakeland, FL 33803, 813-686-3311.

Reader Service ✓ 581

Briefcase-Sized Printer

The problem with most portable computers is that you have to wait until you get back to your home or office to print your notes and letters. All that changes with the Riteman printer. It's a high-quality dot-matrix printer that fits into a briefcase. It measures approximately 3 by 10½ by 14 inches, and weighs 11 pounds.

The Riteman printer prints 120 characters per second in its bidirectional mode, and comes with automatic friction feed. Its high-quality ribbon cassette is guaranteed for one million impressions. Other features include a tractor feed unit with a custom-smoked plexiglass cover, printing starting at one inch from the top of the page, and upper-/lowercase characters with descenders.

Available with Centronics-parallel interface, the Riteman printer is priced at \$499 from Inforunner, 1621 Stanford St., Santa Monica, CA 90404, 213-453-8731.

Reader Service ✓ 558

It's a Smal World After All

Previously available to only OEM hardware or software distributors, Smal-LDOS is now available to all you hackers at less than half the price of the full LDOS system. This sophisticated operating system contains all of the popular LDOS commands. The system includes several functions, such as job control language, keyboard type-ahead, and a printer forms controller. The package also includes an advanced version of Disk Basic (LBA-SIC) for the serious programmer.

Smal-LDOS is available for the Models I, III, and 4 for \$59. Contact Logical Systems Inc. for further information at 8970 North 55th St., P.O. Box 23956, Milwaukee, WI 53223, 414-355-5454.

Reader Service ✓ 561

Lock 'em Up!

Protect your floppy disks from unauthorized use with the MDT070, a locking storage system for 5¼-inch magnetic media. It safely stores up to 70 disks. The MDT070 features a locking hinged lid, two built-in carrying handles, and interior disk dividers. The rugged tray is injection

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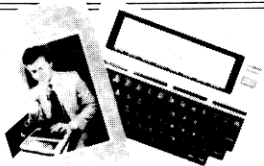
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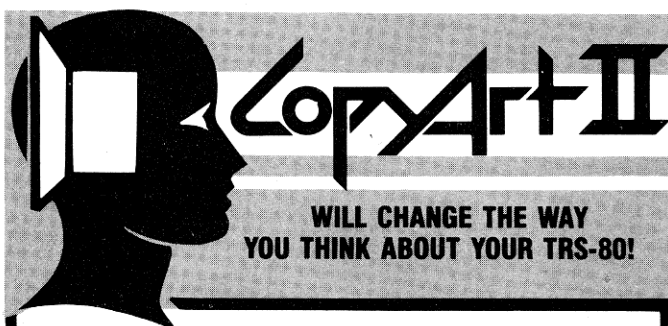
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**WILL CHANGE THE WAY
YOU THINK ABOUT YOUR TRS-80!**

THE MOST POWERFUL WORD PROCESSOR AND ALL PURPOSE COMPUTER PROGRAM AVAILABLE FOR THE TRS-80.

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1. INSERT characters, words, lines, paragraphs or other files.
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3. COLUMNS. CopyArt II can be instructed to print your text from one to six columns. Super easy to use! No complicated commands. Great for doing newsletters, magazine layouts etc. **NO MORE CUT AND PASTE!**
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5. Screen widths from 32-255 characters wide. Screen widths can be changed to allow formatting your text as you want.
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7. *GRAPHICS. CopyArt has a built in graphics program that allows inserting graphics within your text. Drawings, graphs, illustrations, cartoons etc. may be used within newsletters or company reports. Graphics commands include: Plot between points, Circles, Squares, Fill, Erase, Draw, Move, Pixel cursor controls and more.
8. *GRAPHIC CHARACTERS. CopyArt has a built in graphics character generator. Used for typesetting large letters from 3 to 25 times normal size! Yes, you can even print characters down the page as well as across. Black on white or white on black.
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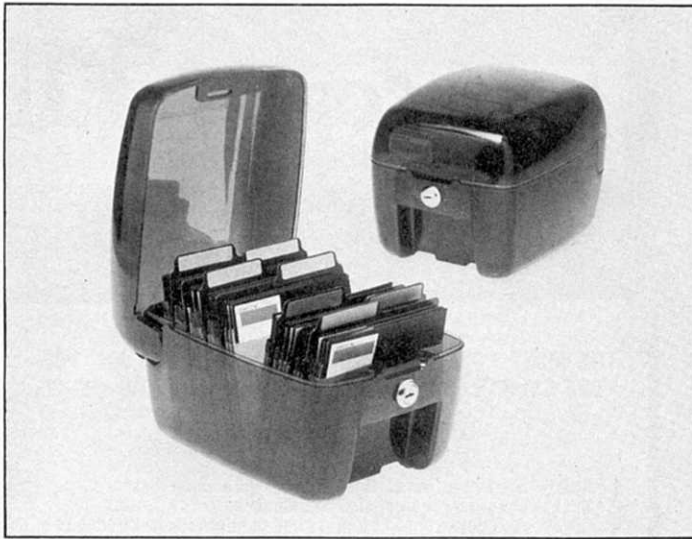


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molded of high-impact plastic for maximum protection of your valuable data.

The MDT070 has a suggested retail price of \$24.95 from Ring King Visibles Inc., 2210 Second Ave., P.O. Box 599, Muscatine, IA 52761, 319-263-8144.

Reader Service ✓ 566

Cutting Through the Glare

There's nothing worse than not being able to see your monitor screen because of glare. You can't escape it,

no matter how you turn your head or move the monitor. Well, now you can fight the glare with Panelgraphic Video Filters.

These transparent neutral-gray thermoformed filter panels increase the ratio of the luminance of the excited phosphor to the background without sacrificing your display resolution. Also, a coating of Vuesguard 901-AG is applied to the filter to reduce glare. This coating is steel-wool abrasion and chemical resistant. A special transparent coating on the rear of the

filter prevents Newton rings.

Available in a wide variety of colors including green and amber, the video filters cost \$21.56 for a 5-inch filter; \$25.75 for 25 inches; \$31.90 for 12-15 inches; \$44.03 for 19 inches; and \$51.38 for 21 and 25 inches. For additional information, contact Panelgraphic Corp., 10 Henderson Drive, West Caldwell, NJ 07006, 201-227-1500.

Reader Service ✓ 582

Hardwood and Hardware

Once you've bought a printer, your next move is to

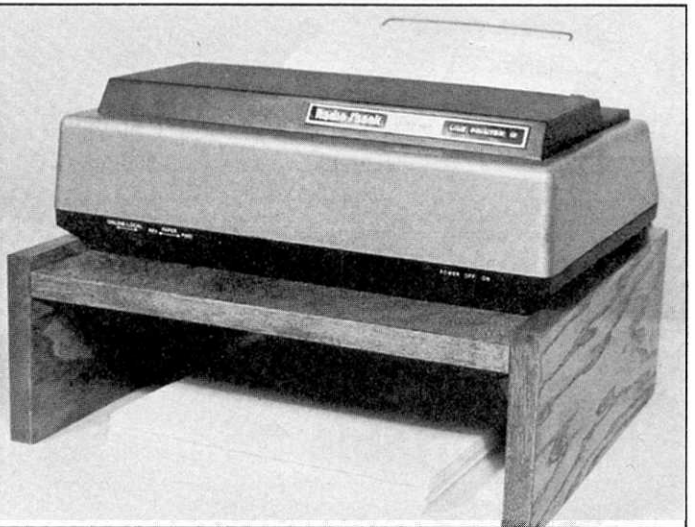
9½- by 21-inch stand.

For further information, contact Woodtec, 320 West Maple, Box 445, Arkansas City, KS 67005, 316-442-7000.

Reader Service ✓ 573

Pocket Manager

PocketPert is a graphics project manager program that runs on both the Radio Shack PC-2 and Sharp PC-1500 pocket computers. It depicts the interrelationships of the tasks in your project by graphing PERT and GANTT charts.



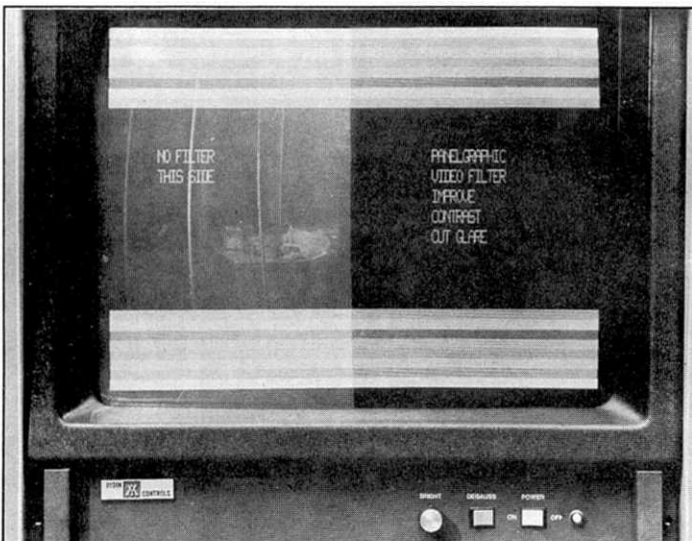
Hardwood veneer, all wood printer stand from Woodtec.

find a suitable printer stand. Woodtec makes a hardwood-veneered, all-wood printer and monitor stand for your system. They glue the joints for extra strength and resistance to vibration.

The stands are available in walnut, teak, or oak finish stains and come completely assembled for your immediate use. Prices start at \$38.95 for a 16½-inch wide stand for the MX-80 or FX-80 printers, and \$40.95 for the 24½-inch wide printer stand. Monitor stand prices start at \$44.95 for their 11- by

To use, you simply enter the data describing the best, worst, and expected completion times for each of up to 25 tasks in your project. The program takes over and calculates the critical path and draws the charts on the computer's four-color pen plotter. The critical path through the project is identified and drawn in a different color. The program calculates slack times and 50 percent and 95 percent expected completion times.

PocketPert costs \$29.95 on tape cassette from PocketIn-



You can see the difference that Panelgraphic Video filters make in cutting annoying glare.

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Tracks Down DATA!!!



• Outputs: instead of the meaningless "equivalent",
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DEFB 03H " LD H,C
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CCF
JR NZ,\$+5 ", etc.

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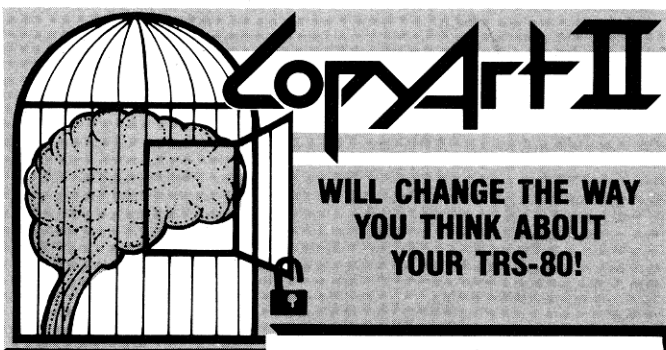
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20. HEADERS and FOOTERS. You can even put graphics within headers for super page layouts.
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22. DOS COMMANDS from within the editor. Kill files, check free space or get directories easily.
23. CUSTOMIZED PRINTER driver. Since your printer has features that other printers don't, CopyArt II will be supplied with the printer driver of your choice below. Each printer driver is custom made to provide you with commands for each of your printer's fine capabilities. If you have more than one printer, order other printer drivers for only \$19.95 each. Printer drivers are available for:

- Radio Shack LP IV, V, VI, VII, VIII and Daisy Wheel II
- Epson MX-80, MX-80/FT, MX-100 with or without grafix.
- Okidata Microline 80, 82a, 83a and 84
- NEC 8023
- Smith Corona Daisy Wheel TP-1
- Brother Daisy Wheel
- C-itho Starwriters and Prowriters all 85 10A, 1550
- PMC Printer
- Centronics 737, 739
- Diablo 620

- OTHERS COMING SOON. Call if you don't see your printer!
24. Unprotected diskette. Unlimited backups can be made.
25. MAILIST/MAILMERGE INCLUDED. CopyArt II comes with a mailist program that stores over 2,000 names on a MOD III diskette. These names can be sorted by any field and have a special field for your code. You can make PERSONALIZED FORM LETTERS that will take the following codes from the mailist and insert them in your text. FIELDS INCLUDE: Mr. or Ms., Last name, First name, Business name, City, State, up to 9 digit ZIP code and your own special 2 character code. ANY OF THESE fields can be inserted within your form letter wherever you want. You can print form letters or mailing labels to all the people on your list or to specific codes only. CopyArt makes it easy.

CopyArt II Continues on
the next page...



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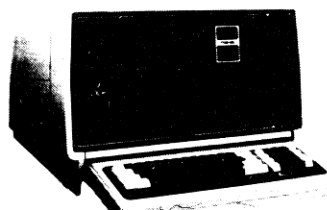
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NEW PRODUCTS

fo Corp., P.O. Box 152, Beaverton, OR 97075, 503-649-8145.

Reader Service ✓ 554

¿Hablas Español?

Now you can do word processing on your Model I or III in Spanish with Computer Software Curriculum's new Spanish language character generator chip. The computer accesses Spanish characters only when you need them; otherwise, your normal character set appears without any special program loading.

Installation is simple and requires no soldering if you own a keyboard that has been modified for upper-/lower-case. However, if your keyboard still has its original

character set, the installation procedure requires some minor soldering.

The Spanish language character chip costs \$99 for the Model I and \$79 for the Model III from Computer Software Curriculum, 1604 Limestone Trail, Fort Worth, TX 76134, 817-293-2282. In addition to this chip, you can order new character chips in any language within the constraints of the CPU. Write for further information.

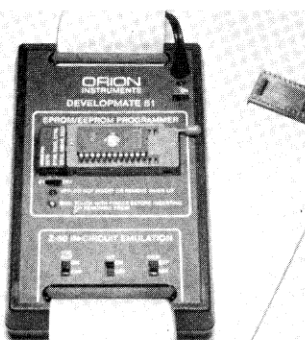
Reader Service ✓ 578

The Lazy Writing Method

Lazy Writer, a popular word processing program from AlphaBit Communications Inc. (13349 Michigan Ave., Dearborn, MI 48126, 313-581-2896), is now avail-

CONVERT YOUR TRS-80 MODEL I, III, OR 4 INTO A

DEVELOPMENT SYSTEM



Now you can develop Z-80 based, stand-alone devices such as games, robots, instruments and peripheral controllers, by using your TRS-80 as a development system. The DEVELOPMATE plugs into the expansion connector of your TRS-80 and adds **PROM PROGRAMMING** and **IN-CIRCUIT-EMULATION** capabilities to your system (with or without expansion interface).

Complete instructions and sample schematics are included to help you design your own simple stand-alone microcomputer systems. THESE SYSTEMS CAN BE AS SIMPLE AS FOUR ICs: one TTL circuit for clock and reset, a Z-80, an EPROM, and one peripheral interface chip.

When the In-Circuit-Emulation cable is plugged into the Z-80 socket of your stand-alone system, the system becomes a part of your TRS-80: You can use the full power of your editor/assembler's debug and trace program to check out both the hardware and the software. Simple test loops can be used to check out the hardware, then the system program can be run to debug the logic of your stand-alone device.

Since the program is kept in TRS-80 RAM, changes can be made quickly and easily. When your stand-alone device works as desired, you use the Developmate's PROM PROGRAMMER to copy the program into a PROM. With this PROM, and a Z-80 in place of the emulation cable, your stand-alone device will work by itself.

The DEVELOPMATE is extremely compact: Both the PROM programmer and the In-Circuit-Emulator are in one small plastic box only 3.2" x 5.4". A line-plug mounted power supply is included. The PROM programmer has a "personality module" which defines the voltages and connections of the PROM so that future devices can be accommodated. However, the system comes with a "universal" personality module which handles 2758, 2508 (8K), 2716, 2516 (16K), 2532 (32K), as well as the new electrically alterable 2816 and 48016 (16K EEPROMs).

The COMPLETE DEVELOPMATE 81, for Model I, with software, power supply, emulation cable, TRS-80 cable, and "universal" personality module \$329

DEVELOPMATE 83, Model III/4 version, same as above \$329
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NEW PRODUCTS

able for your Model 4. It takes full advantage of the Model 4's 24- by 80-character display. Text created with this version is compatible with text created on the 16- by 64-character version on the Models I and III.

The Model 4 version costs \$175 for new buyers, and comes with two complete sets of programs: one to use on any Model III operating sys-

tem, the other for TRSDOS 6.0. Current Lazy Writer users can buy the new Model 4 programs for \$39.95.

AlphaBit also makes a special version of Lazy Writer for the Lobo MAX-80, which also has the 24- by 80-character display. It operates under the LDOS operating system. Prices are the same as listed above.

Reader Service ✓ 568

DIFFERENT TRACK



A clean computer is a happy computer.

Crummy Keyboard?

Take a look at your computer keyboard. See all that dust and lint between the keys? Don't try to wipe it away with a dust cloth; that won't do the job. Instead, grab hold of the Mini-Vac and suck it all up! The Mini-Vac is a lightweight, quality constructed vacuum cleaner that removes minute particles of dust and debris from hidden or hard-to-reach areas.

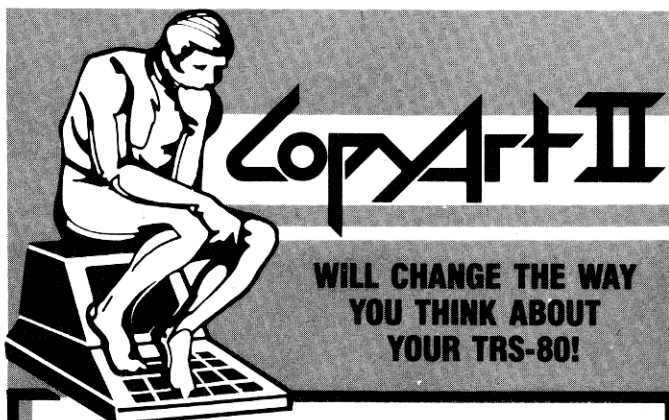
The Mini-Vac comes with two interchangeable wands, two fine bristle brushes, and a cloth vacuum bag. It can be either ac or dc powered. It's perfect for cleaning your camera, computer equipment, tape deck, turntable, and other equipment.

This compact and portable vacuum costs \$29.95 with a 90-day guarantee from Mini-Vac Inc., P.O. Box 3981, Glendale, CA 91201, 213-244-6777.

Reader Service ✓ 572

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

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26. **SIMPLE CURSOR** commands. Simply use the arrow keys to move your cursor around the text. The screen will scroll both vertically and horizontally. Shift arrows take you to the beginning or end instantly.

27. **HI-Resolution** graphics supported.

28. **COMPLETE MARGINS CONTROL.** You tell CopyArt II what margins you desire. You can even change margins within the same text. You may also have parts of your text with 2 columns, some with one etc. It's super easy to use.

29. **BASIC PROGRAMS** can be edited easily. CopyArt is really useful for inserting graphics within quoted strings to give your programs super animation without the hassle of calculating the CHR\$ of the graphics!

30. **VISCALC** files can be loaded into CopyArt II to be manipulated easily. Great when you want to accompany your Visicalc reports with written reports, **GRAPHS** and **BOLDFACING** etc. Visicalc reports up to 255 wide can be loaded.

31. **SPECIAL SCRIPSIT FILE LOADER.** Allows you to load your old Scripsit files without having to save them in ASCII. Copyart will also load Pencil files and other normal ASCII files.

32. Similar to Scripsit. If you have used Scripsit, you can use Copy Art in minutes.

33. **CONTROL CODES.** Lets you insert special printer control codes in your text. CODES between 0 and 255.

34. **BLOCK MOVE.** Simple and powerful block move. Lets you move paragraphs or lines of text around easily. No complicated marker settings required.

35. **FIND/REPLACE/REPEAT.** Lets you find a string of characters and replace them with any other string of characters up to 20,000 times! **WILDCARD** search also supported.

36. Professional Manual in easy to understand English.

Copyart II requires a TRS-80 Model I or III, (or PMC-80 or LNW), 48k and 2 disk drives with Newdos-80, Ldos, Multidos, Dosplus or TRSDOS. Double density disk drives recommended for the Model I.

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January

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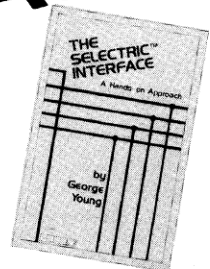
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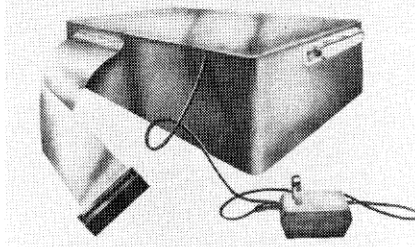
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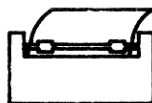
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Dixon	"Mighty Write."	10/83:266		100	A word processing program for the Model 100.
Dixon	"Cram 100"	10/83:283		100	An exciting line-action game.
Eisenberg	"Monitor 100."	7/83:178		100	Taking a look inside your Model 100.

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INSTANT ASSEMBLER

The **Instant Assembler** is a powerful assembly language development system for the TRS-80. If you are already an assembly language programmer, its unique design will greatly increase your productivity. If you are just getting started, there is no better assembler to help you learn machine language programming. Some of its unique features are immediate assembly, which detects syntax errors as source is entered, and a compact source format that allows you to write programs nearly three times as large as other assemblers in the same amount of memory. It will assemble to disk, tape, or directly to memory for immediate debugging with the built-in debugger, and also produces relocatable code modules that can be saved on disk or tape and linked together in memory for large or modular assemblies. You can quickly switch from assembler to debugger without losing your source. The built-in debugger will step through your programs one instruction at a time, showing each disassembled instruction and its effect on the registers and memory. It will load or save both conventional source files and its own condensed source format.

The **Instant Assembler** package includes six separate programs. The assembler itself includes the editor and built-in debugger. The **Linking Loader** is included in several versions for different memory sizes. A stand-alone version of the debugger (**MicroMind**) is also included. **MicroMind** can be relocated in memory and has commands to single-step, set breakpoints, display or alter registers or memory, find bytes or words, disassemble to screen or printer, convert between hex and decimal numbers, and write **SYSTEM** tapes. The **Instant Assembler** comes with a comprehensive 65 page instruction manual with many examples.

Specify Model I or Model III. **TAPE INTASM 2.1** \$39.95 on tape
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TELCOM

Mumford Micro offers two telecommunications programs. **TELCOM I** has most of the features needed to communicate with bulletin boards, time share systems, or for file transfers between two disk-based micros over modems or direct wire. It is menu driven and extremely simple to use. Functions include transmit a disk file, receive a disk file, save received data on disk, examine and modify **UART** parameters, 8 programmable log-on messages, automatic checksum verification of accurate transmission and reception, and many more user conveniences. Supports line printers, lowercase characters, Xon/Xoff protocol, and programmable character keys.

TELCOM II is an expanded version of this program for the most demanding telecommunications applications. The terminal mode now has a help menu and a large printer spooler for high baud rates. From within the terminal mode you can load disk files into the memory buffer, type into the buffer, transmit the buffer, or view the buffer or data that has already scrolled off the screen. It has 10 different programmable messages that can each be sent with a single command for auto log-on or auto dialing, and 5 different character translation tables.

TELCOM II also includes an error correction file transfer mode which is compatible with the **LYNC** program available on CP/M systems and the IBM PC. **TELCOM II** will exchange disk files with any computer running this protocol (including another TRS-80 running **TELCOM II**), and will automatically detect and correct errors in transmission. Files can be sent to or fetched from an unattended computer. The extreme ease of use **TELCOM I** is known for has not been compromised. Reconfiguration of the programmable features is done internally from clear menus for fast, easy operation. Both versions of **TELCOM** come with complete instruction manuals, which are available separately for \$5 to help you decide which program is best suited to your needs.

Specify Model I or Model III. **TELCOM I** \$39.95 on disk
Specify Model I or Model III. **TELCOM II** \$69.95 on disk

MODEL I CLOCK MOD

The **SK-2** clock modification allows CPU speeds to be switched between normal, an increase of 50% or 100%, or a 50% reduction. Speeds may be changed with a toggle switch (not included) or on software command. It can be configured to return to normal speed any time a disk is active and has provisions for adding an LED to indicate when the computer is not at normal speed. It mounts inside the keyboard unit with only 4 necessary connections and is easily removed if the computer ever needs service. The **SK-2** has been field proven by 3 years of use, and comes fully assembled with socketed IC's and illustrated instructions.

Model I only. **SK-2** \$24.95

DISK INDEX

DISK INDEX will assemble a master index of your entire program library by automatically reading the program names and free space from each disk. The index may then be alphabetized or searched for any disk, program, or extension. It will alphabetize 2400 programs in less than 50 seconds and will find any program out of 2400 in less than 3 seconds. Disks or programs may be added or deleted manually, and the whole index or any selected part may be printed on paper in several different formats. The index itself may also be stored on disk for future access and update. A 48K machine will hold up to 255 disks and over 2400 programs in each file, and you may build as many files as you need. There is no limit to the number of filenames it can read on any one disk. It will run on either a Model I or Model III and catalog disks for either machine regardless of which one is running it, though Model I owners must have double density to catalog Model III disks. It will automatically recognize any DOS and disk density. **DISK INDEX** works with any operating system written for the Model I or Model III except CP/M, and is extremely fast and easy to use.

Specify Model I or Model III. **DISK INDEX VERSION 3** \$29.95 on disk

INSIDE LEVEL II

The Programmers Guide to the TRS-80 ROMS

INSIDE LEVEL II is a comprehensive reference guide to the Model I and Model III ROMS which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the **SYSTEM** command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer. 80 Micro said "The book has no flaws; it is a perfect gem." Byte Magazine said "I recommend this book to serious machine language programmers."

Includes updates for Model III. **INSIDE LEVEL II** \$15.95

DEMON DEBUGGER

DEMON (for **DEBUgger** and **MONitor**) is a sophisticated tool with which you can explore and debug machine language programs. It has two modes of operation. In the **STEP** mode, it "emulates" the operation of the Z-80 and allows you to step through any machine language program one instruction at a time, showing you the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The 19 different **STEP** mode commands include step, step to a branch, run in step mode at a variable rate, run for a specified number of steps, change flags or registers, execute a **CALL** or **RST**, set breakpoints in RAM or ROM, and break when a number in a defined range appears in any double register. The 26 commands in the **MONITOR** mode include hex arithmetic, hex to decimal conversion, block move, fill memory, find bytes, jump to address, disassemble to screen, printer, disk, or tape, load memory from disk or tape, write memory to disk or tape, full screen memory edit in hex or ASCII, and relocate other programs or itself. Screen displays may be routed to your line printer for hard copy. **DEMON** includes a comprehensive 40 page manual with many examples.

Specify Model I or Model III. **DEMON** \$29.95 on tape or disk

8748 ASSEMBLER

Assemble programs for the complete Intel MCS-48 family of microcontrollers including the 8741, 8742, 8748, and 8749 on your Model I, III, or IV Assemblies from a source file written on your text editor directly to an object file on disk. It supports the standard Intel mnemonics and features conditional assembly and listing, complete expression evaluation, ten significant characters for symbols, a complete range of pseudo-ops, and informative error messages. It comes with a comprehensive instruction manual which includes the instruction set for each component and sample listings for arithmetic and I/O subroutines. We also offer plans, schematic, and software to help you build your own inexpensive 8748 programmer. The 8748 is a readily available single chip computer that contains RAM, EPROM, clock oscillator, a counter/timer, and 27 I/O lines in a single 40 pin package. A complete computer controller can be built with this one chip, a crystal, three capacitors, and a five volt power supply.

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Eisenberg	"Consulting the I Ching."	10/83:267		100	Finding guidance to problems with the 100.
Firschein	"Harmony and Me."	11/83:265		100	A tone generator for the Model 100.
Jarvela	"Punch Out."	7/83:172		100	A portable payroll program.
Jarvela	"The Final Notice."	7/83:176	9/83:22	100	A payment-scheduling program.
Jarvela	"Subterra."	8/83:203		100	Richard Ramella's adventure game gone portable.
Jarvela	"If It's Tuesday."	9/83:285		100	A currency and measurement conversion program.
Jarvela	"To Market, To Market."	10/83:276		100	A portable shopping list program.
Jarvela	"Nag Analysis."	11/83:264		100	A program that rates horses by a handicapping system.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Shows how to build your own inexpensive modem cable.
Ramella	"The Year in Review."	8/83:207		100	A bar graph that displays data for a 12-month period.
Ramella	"Elapsed Time."	9/83:284		100	Marks the start and end times of a program and gives the elapsed time.
Serotta	"Blackjack."	12/83:247		100	A simulation of the popular casino card game also known as 21.
Sumner	"Inside the Model 100."	12/83:232		100	An extensive memory map for the Model 100.
Woodbury	"Gas/Oil Mileage."	7/83:170		100	Keeping track of your car's gas and oil consumption.
Woodbury	"Traveling Expenses."	7/83:171	9/83:22	100	A program that cumulatively records your travel expenses.
Woodbury	"The Rule of 78."	7/83:180		100	Calculating the interest on a loan.
Woodbury	"Intel."	8/83:201		100	A portable chess-pawn game.
Woodbury	"Renumber 100."	8/83:206		100	A renumbering utility.

COMMUNICATIONS

Author	Title	Issue:Page	Debug	Model	Annotation
Aldrich	"Satellite Word Processing."	9/83:180		I, III, CoCo	Using your Color Computer as a satellite terminal.
Cameron & Gould	"Compac."	3/83:280		I	A communications package for your computer.
Conviser	"The Murphy Box."	4/83:300			Use this device to diagnose your acoustic coupler's problems.
Miller	"Into the 232."	A/83:582			The scoop about the RS-232 port.
Moyer	"Auto-Dial/Auto-Answer."	A/83:300		I	An addition to your modem that lets your computer answer and dial your phone automatically.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Shows how to build your own inexpensive modem cable.
Payne	"Talk to the Big Guys."	9/83:230	12/83:20	III	A dumb-terminal program.
Rappaport	"Smartcat."	A/83:278		I, III	A powerful communications package for your computer.
Steele	"CASS-80."	2/83:152	5/83:26	I, III	How to have your own cassette-based bulletin board.

DATA-BASE MANAGERS

Author	Title	Issue:Page	Debug	Model	Annotation
Barbarelo	"Financial Transactions Recorder."	9/83:140		II, 16	Organize and tally your business deals.
Eisenberg	"Aid for AIDS-III."	9/83:216		I, III	Getting the most out of this DBMS.
Fiorelli	"Inside AIDS-III."	3/83:136		I, II, III	All about the AIDS-III data-base manager.
Fiorelli	"Inside AIDS-III—Part II."	4/83:168		I, III	Round off your data-management system with MAPS-III, CALCS-III, and MERGE-III.
Ford	"Profile II Modified."	5/83:230		II	Make Profile II easier to use.
Keller	"The Data Base Explained."	A/83:32			An introduction to data bases.
Knight	"Directory Information, Please."	A/83:320	2/83:32		A flexible disk directory to meet your needs.
Mabry	"Profile File Transfer."	7/83:290	10/83:22	I, III	Put Profile data in new files.
Nestor	"Service with a Smile."	7/83:240		II, 12, 16	Learn Basic programming while keeping customer records up-to-date.
Terre	"FlexCat, Your Basic DBM."	A/83:264	5/83:27	I	A data base that meets all your filing and retrieval needs.
Townsend	"Making Hay with Arrays."	10/83:234		I, III	Random access without disk drives.
Trojak	"Finding the Search Solution."	12/83:110		II, III	Search text files faster with signature screening.

EDUCATION

Author	Title	Issue:Page	Debug	Model	Annotation
Albino	"Billy and the Electric Troll."	5/83:320		I, III	Let these creatures teach your children number patterns.
Bahcall	"Fun for the Younger Set."	2/83:254		I, III	Introduces your youngster to the TRS-80 with math and word programs.
Biedenweg	"Refrigerator Controller."	2/83:212		I	Control the lighting and temperature of your refrigerator for science projects.
Brackney	"TRS-Turtle."	2/83:116	6/83:23	I, III	Brings this famous teaching tool into your Tandy machine.
Cecil	"Long, Long Division."	A/83:284		I	Learning division with a patient tutor.
Christensen	"Horse Race II."	2/83:237		I, III	Revision of a previously published program: Now it's more educational.
Gillen	"Robot Reader."	6/83:302		I, II, III, 12, 16	A Basic program that analyzes text and tells you its difficulty level.
Groll	"The 2,000-Year-Old Algorithm."	3/83:332	6/83:22	I, III, CoCo	Teach your computer to find the greatest common denominator.
Haan	"Math Fun."	2/83:184		III	Learning addition and subtraction the easy way.
Hawkins	"Son of Pilot."	2/83:218		I, III	An altered version of Pilot for your use.
Jacobs	"Election."	A/83:148	5/83:26	I, III	All about the intricacies of campaigning.
Knight	"Math Hangman."	A/83:274		I, III	Develop your math skills with this game.
Krengel	"Spelling Challenger."	2/83:178		I, III	Three word programs that help increase your spelling skills.
Lacy & Gorden	"Colorful Language Instruction."	A/83:442	5/83:26	CoCo	A graphic depiction of how your mouth makes certain sounds.

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Modney	"Michael's Game."	2/83:208	7/83:22	I, III	Overcoming computer fear with fun programs for children.
Morgenstern	"Maxwell's Demon."	8/83:234		I, III	Learning thermodynamics the fun way.
Neidenbach	"Foreign Flag Quiz."	2/83:149		I, III	Tests your knowledge of world flags.
Perelman	"B\$ Sharp."	3/83:236		II, 16	Teaches your child musical note recognition.
Perry	"Color Life."	2/83:314		CoCo	Learning about the development of communities of organisms.
Stone	"The Glamour of Grammar."	A/83:228		I, III	Learn grammar rules and have fun doing it.
Weide	"States and Capitals."	2/83:166		CoCo	Learning the states and capitals.

FILE HANDLING

Author	Title	Issue:Page	Debug	Model	Annotation
Baker	"Using Data Files—Part I."	6/83:258		I, II, III	Learning how to handle data files correctly.
Barak	"Statements in Common."	5/83:144		I, II, III	Transferring data from one program to another.
Castor	"Cassette Operating System."	3/83:226		I, III	Data-base management with a tape-based system.
Collins	"DATATP."	10/83:252		I	A hybrid Basic and Assembly listing that simplifies tape data handling.
Faulds	"Tape File Manager."	1/83:324		I	Four routines that will speed up your buffer's reading and writing capabilities.
Ford	"Profile II Modified."	5/83:230		II	Making Profile II easier to use with minor modifications.
Haan	"What's the DIF?"	9/83:108		III	Accessing VisiCalc files from Basic for error-free reports.
Haan	"Assembly-Language Disk I/O."	12/83:88		III	Mastering Assembly-language's I/O techniques for more efficient programs.
Heusinkveld	"Color Computer Merge."	2/83:332		CoCo	Lets you concatenate your programs on tape.
Kepner	"Mod II Random Access."	2/83:280		II	A description of how the II random access really works.
Mabry	"Profile File Transfer."	7/83:290	10/83:22	I, III	An easy Basic program that puts Profile data in new files.
Murray	"Chameleon Code."	12/83:170		I	From Assembly-language to Basic in the blink of an eye.
Nestor	"Mod II File Transfer Utility."	9/83:268		II	How to transfer disk files.
Nicolettos	"Cassette Merge."	1/83:310		CoCo	Combining old Color Computer programs with new ones, and without any retyping!
Reardon	"Sorting in Place."	10/83:172		I, II, III	What to do when there's no room for a random-access disk file.
Sprouse	"Color Disk Directory."	4/83:285	8/83:28	CoCo	A master directory that helps you categorize and quickly locate programs and files.
Townsend	"Making Hay with Arrays."	10/83:234		I, III	Random access without disk drives.
Trojak	"Finding the Search Solution."	12/83:110		II, III	Search text files faster with signature screening.

FINANCE

Author	Title	Issue:Page	Debug	Model	Annotation
Barbarelo	"Financial Transactions Recorder."	9/83:140		II, 16	A data base that organizes and tallies your business deals.
Bell	"Straddle the Market."	11/83:242		I, III	An introductory program to stock options.
Cangro	"The Business of Planning."	9/83:74		I, III	Using Monte Carlo analysis to defeat business problems.
Haan	"What's the DIF?"	9/83:108		III	Accessing VisiCalc files from Basic for error-free reports.
Kemball-Cook	"Build a Better Budget."	3/83:246		I	Let your computer become a financial expert.
Perelman	"Investment Advisor."	A/83:564		II, 16	Determines the profit margin of an investment.
Plyer	"Project Assessment Technique."	9/83:128		I, III	Calculates the rate of return and plans business alternatives.
Sprouse	"Denominational Computation."	1/83:227		CoCo	A financial statement program for the Color Computer.

FORMAT

Author	Title	Issue:Page	Debug	Model	Annotation
Barbarelo	"Space Maker."	11/83:186		II, 16	Inserting spaces into your compressed program listings:
Belcher	"Screen Format Program Generator."	2/83:296		I, III	Lets your computer figure screen locations, field prompts, and input fields.
Chidsey	"Bit Smitten—Part VI."	1/83:316		I, III	How to create nice looking title and credit pages for your programs.
Faulds	"Tape File Manager."	1/83:324		I	Four routines that will speed up your buffer's reading and writing capabilities.
Haan	"What's the DIF?"	9/83:108		III	Accessing VisiCalc files from Basic for error-free reports.
Knight	"Directory Information, Please."	A/83:320	2/83:32		A flexible disk directory to meet your needs.
Morra	"Disk Mysteries Revealed."	A/83:44			Everything you ever wanted to know about floppy disks.

GAME

Author	Title	Issue:Page	Debug	Model	Annotation
Alar	"Armageddon."	8/83:86		III	Save the city from falling meteors.
Albino	"Commander Flynn in Color."	4/83:242		CoCo	Wild adventures in space.
Albino	"Billy and the Electric Troll."	5/83:320		I, III	Let these creatures teach your children number patterns.
Bell	"Micro-Melodies."	8/83:182		I, III	A new way of testing your memory—match those tunes.
Blatt	"In Search of . . ."	10/83:244		I, II, III	Hides words in diabolical puzzles.
Cataldo	"Building a Better Adventure."	1/83:268		I, III	Knowing about parsing helps you to create better games.
Cebik	"Depth Charge."	11/83:244		I, III	Destroy undersea bases.
Chermak	"Two-Person Space Bomber."	A/83:244		I	Defend your planet from bombs being dropped by an

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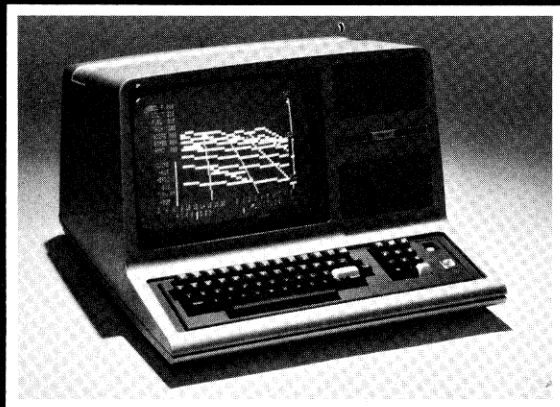
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Christensen	"Horse Race II."	2/83:237		I, III	opponent. Revision of a previously published program: Now it's more educational.
Cohn	"Fly Like an Eagle."	A/83:306	8/83:28	I	Be behind the controls of this simulation of a sailplane race.
Collura	"Categories."	A/83:200		I, III	Finding words that match the categories.
Conforti	"Muddy Pig Simulator."	8/83:120		III	Catch the muddy pig, if you can.
Cook	"Android Picture Gallery."	A/83:190		I, III	A game that keeps you dusting up the art gallery.
David	"Light Cycle."	8/83:268		I, III	Rev up your light cycle and paint your video screen.
Dixon	"Foxfighter."	8/83:200		100	Clear the sky of air-mines suspended over a city.
Dixon	"Cram 100."	10/83:283		100	An exciting line-action game.
Efroymson	"Pick a Card..."	A/83:176		I	The computer becomes a magician in this exciting card game.
Finkelstein	"Turret."	3/83:326		I, III	Pit your skills against an oncoming invader.
Fisher	"Prime Mission."	11/83:256		I, III	Save the planet from attacking, vicious prime numbers.
Gulick	"Peek Pong."	2/83:310		I, III	Playing a fast table tennis game with your TRS-80.
Hague	"Bustout."	6/83:296		CoCo	A Color Computer version of the popular arcade game.
Hanson	"Outbreak."	1/83:216	6/83:22	I, III	A Basic version of the popular arcade game.
Harrell	"Fortran Breakout."	7/83:186	12/83:20	I, III	A popular arcade game converted to the TRS-80.
Hildreth	"Time Warp."	3/83:218		I, III	Destroy all the time gates and live.
Huben	"Music Composer."	2/83:104		CoCo	Store up to 200 notes on your Color Computer and save the music on tape.
Jarvela	"Subterra."	8/83:203		100	Richard Ramella's adventure game gone portable.
Johnstone	"Lost on the Great Barrier Reef."	8/83:92		I, III	An adventure that might leave you stranded.
Karr	"Maze Chase."	8/83:272		I, III	Catch the asterisk before enemies catch you.
Kime	"Batter Up!"	4/83:130		I, III	Playing baseball when you can't get out to the park.
Knight	"Math Hangman."	A/83:274		I, III	Develop your math skills with this game.
Koch	"Lunar Lander."	1/83:188		II	Model II lunar landing game.
Krengel	"Spelling Challenger."	2/83:178		I, III	Three word programs that help increase your spelling skills.
Kupchanko	"Boxer."	2/83:134		I, III	Tests your pugilistic skill in this game that pits you against the computer.
Lake	"Project Deep Dive."	2/83:96		I, III	Guide your sub through a winding tunnel filled with mines and torpedos.
Llamas	"Almazar I."	A/83:288		I, III	A multi-part adventure game.
Lott	"Model II Casino."	8/83:148	11/83:24	II	It's Las Vegas Night for the Model II.
Michaels	"Kings and Castles."	8/83:246		CoCo	Use your warriors to become Monarch of all kingdoms.
Michel	"Ultimate Joystick Interface."	A/83:592		I	A cheap and easy-to-build joystick interface.
Miller	"Byte Cycles."	2/83:132		CoCo	A joystick game a la the light cycle races in TRON.
Mills	"Strip Blackjack."	8/83:256	10/83:22, 12/83:20		Playing for high stakes in this adult version of a computer favorite.
Modney	"Michael's Game."	2/83:208	7/83:22	I, III	Overcoming computer fear with fun programs for children.
Morgenstern	"Maxwell's Demon."	8/83:234		I, III	Learning thermodynamics the fun way.
Norman	"The Lair of Kraken."	2/83:124		CoCo	Travel through an underwater palace, battling the abominable Kraken.
Parks	"Tee-Off."	4/83:108	9/83:22	I, III	A golf game in which you have to contend with the hazards and wind conditions.
Ramella	"Brainstorm."	A/83:213		I	This game challenges you with number sequences.
Riggs	"Soccer Anyone?"	4/83:322		CoCo	A fast-action, two-person game of soccer.
Rogers	"Jet Bomber."	5/83:298	8/83:26	I	A game that features screen-scrolling.
Saisi	"The Poop on PEEK."	3/83:278		CoCo	Give your arms a rest during fast games by using PEEK instead of INKEY\$.
Satterfield	"Attack of the TRS-80."	8/83:226		I, III	Save a lunar colony from a crazed Model I.
Schmidt	"Quest for the Key of Nightshade."	2/83:85		I, III	An adventure game written in Assembly language.
Serotta	"Blackjack."	12/83:247		100	A simulation of the popular casino card game also known as 21.
Skapura	"Collegiate Capers."	8/83:212		I, III	College years relived and remembered.
Sutton	"Color Computer Color Code Combo."	5/83:254		CoCo	A game in which you use logic to guess the color combinations.
Toscani	"Games in Color."	A/83:416		CoCo	Color Computer games that will keep you amused and busy.
Uglum	"Rat Maze."	8/83:110		CoCo	A game that lets you feel like a laboratory animal.
Wells	"Math Countdown."	2/83:160	9/83:22	I, III	A basic-math learning game.
White	"Dogfight."	1/83:192		CoCo	You're a flying ace shooting the enemy's biplanes.
Wood	"Return to the Castle."	4/83:326		CoCo	An adventure game complete with dragons, princesses, and gold.
Wood	"Solitary Maneuvers."	A/83:440		CoCo	The Computer is your opponent in this followup to Colorful Maneuvers.

GENERAL

Author	Title	Issue:Page	Debug	Model	Annotation
Boyd	"Memory Exerciser."	4/83:332		II, 16	Let your computer help strengthen your memory.
Busch	"DROSSDOS/8E."	1/83:342		I, III	KTI takes on the world of disk operating systems.
Busch	"Monkey Business."	5/83:324		I, II, III	KTI strikes again: A novel-writing computer.
Dacus	"Reconcile with Color."	A/83:482		CoCo	Your Color Computer organizes your checkbook and reconciles bank statements.
Deming	"When OK Isn't."	1/83:348		CoCo	Changing your computer's prompts.
Grout	"Twinkle, Twinkle, Little Star."	2/83:270		I, III	Writing graphic poetry on your computer.
Grout	"Apple Core Emulator."	6/83:78		I, III	Shows how your TRS-80 can write and run Apple II software.
Keen & Dischert	"Channels of Communication."	12/83:140		I, III	How to access over 140 TV stations with a satellite dish.
Maloney	"Punklist."	4/83:141		I, II, III, 12, 16	Search for the perfect name for your rock group.

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MMCMP — CP/M86 Disk Operating System	\$249.00
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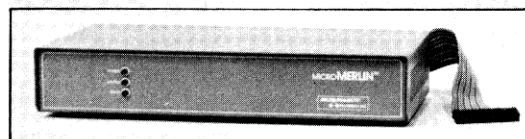
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Martel & Nicholas	"Drop Your Color Computer Into Disk Drive."	2/83:282		CoCo	Upgrading your Color Computer to disk drives.
McDowell	"Insure Your Computer."	A/83:40			How to purchase insurance for your computer.
Mendez	"Hello Bar Codes, Goodbye Keyboard?"	11/83:94			An introduction to bar codes and bar-code readers.
Neibauer	"A History of Programming Languages."	7/83:228			Traces dialects' development from the days of wires and switches to the modern programming era.
Sprouse	"Denominational Computation."	1/83:227		CoCo	A financial statement program for the Color Computer.
Trojak	"Finding the Search Solution."	12/83:110		II, III	Search text files faster with signature screening.

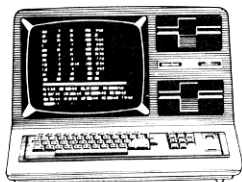
GRAPHICS

Author	Title	Issue:Page	Debug	Model	Annotation
Barbarelo	"Take a Letter..."	A/83:558		II, 16	Draw large block letters using regular size letters, any printer, and a Model II.
Belcher	"Screen Format Program Generator."	2/83:296		I, III	Lets your computer figure screen locations, field prompts, and input fields.
Berman	"Block Letters for the Mod II."	1/83:178		II, 16	Print block letter titles on your fanfold printouts.
Brackney	"TRS-Turtle."	2/83:116	6/83:23	I, III	Brings this famous teaching tool into your Tandy machine.
Calmettes	"LP VII Screen Printout."	2/83:252		I, III	Reproduces the video display on paper.
Chidsey	"Bit Smitten—Part VI."	1/83:316		I, III	Teaches you how to create nice looking title and credit pages for your programs.
Clinger	"Tiger Graphics."	A/83:326		I	Graphic techniques for the IDS Paper Tiger printer.
Cole	"The 80 Goes Color."	5/83:90		I, III	Color for the Model III.
Cole	"The 80 Goes Color—Part II."	6/83:116		I, III	USR routines to enhance your programming of color graphics.
Colle	"Color Sketchpad."	6/83:110	11/83:24	CoCo	Your Color Computer's keyboard helps you design graphics.
Commander	"Something-Or-Other 3-D."	A/83:436		CoCo	A 3-D program that features a rotating cube in two colors.
Corbani	"Business Graphics."	5/83:326		I, III	Self-documenting subroutines that tell your company's story in graphics.
Davis	"A Turn of the Screw Revisited."	5/83:246		CoCo	3-D graphics on your Color Computer.
Fowler	"Symmetrical Graphics."	5/83:104		I, III	Learn about the visual symmetry of rotations in a plane and of reflections across a line.
Freese	"Music-80."	3/83:310		I	Belt out your favorite tunes with this music interpreter.
Grant	"Mod II CRT Controller."	7/83:208		II, 12, 16	Program the Model II's chip and control up to 16 screen functions.
Harkness	"Model II Business Bar Graphs."	A/83:538		II, 16	Produce bar graphs like those on the Model III.
Hinrichs	"Rapid Prints."	5/83:198		I, III	Draw hundreds of figures, and shorten printing time with these Fortran and Basic programs.
Hinrichs	"3-D Printer Graphics."	5/83:236		I, III	Creating 3-D graphics on your dot-addressable printer.
Kalinowski	"PRINT @ Graphics."	3/83:164		I, III	Demonstration programs that help you produce graphics and improve your programming skills.
Kalinowski	"Grafrax Art Palette."	11/83:140		I, III	Programs that allow you to produce full-color printouts.
Keller	"The Printer as a Paintbrush—Part I."	5/83:218		I	Learning to use dot-addressable graphics.
Keller	"The Printer as a Paintbrush—Part II."	6/83:282		I	Reproducing the finer shading levels.
Kitsz	"3-D For Real."	A/83:427		CoCo	3-D and Color Computer graphics.
Lacy & Gorden	"Colorful Language Instruction."	A/83:442	5/83:26	CoCo	A graphic depiction of how your mouth makes certain sounds.
Myerson	"Super-Draw."	2/83:108		I, III	Turn your CRT into a sketch pad and save your drawings.
Norman	"High-Res Alphanumeric."	A/83:469		CoCo	Making your own high-res character sets on the Color Computer.
O'Dell	"The Artful Plotter."	9/83:208		III	Plotting intricate, eye-catching figures on Radio Shack's plotter/printer.
Ohs	"Flowchart Generator."	6/83:246		I, III	Makes it easier to plan your programs.
Perelman	"B\$ Sharp."	3/83:236		II, 16	Teaches your child musical note recognition.
Ramella	"The Year in Review."	8/83:207		100	A bar graph that displays data for a 12-month period.
Ring	"Chart Maker."	3/83:354		I, III	A bar-graph program to help you bring those figures into focus.
Thornton	"Bars and Stripes Forever."	11/83:104		III	A look at industrial bar codes, with three popular styles for your Model III.
Thornton	"Check-Out UPCs."	11/83:114		I, III	How to create and print UPC codes.
Thume	"Better CoCo Graphics."	6/83:164	11/83:24	CoCo	Graphics editor for the Color Computer.
Tinsley	"Graphics on the Line Printer VII."	4/83:306	8/83:28	I, III	Everything you need to know about creating graphics on the LP VII.

HARDWARE

Author	Title	Issue:Page	Debug	Model	Annotation
Barbarelo	"Model II Real-World Input-Output."	6/83:270		II	A capacitance meter that lets your computer communicate with the outside world.
Barbarelo	"The Biobox."	10/83:176		II	A biofeedback interface that helps you monitor your stress.
Biedenweg	"Refrigerator Controller."	2/83:212		I	Control the lighting and temperature of your refrigerator for science projects.
Brewer	"CP/M Cheap."	3/83:112		III	A CP/M modification for \$5.
Brothers & Durbin	"Computer Security with a Credit Card."	3/83:74		I	Limit computer access with a credit card.
Cameron	"Using the Model III I/O Bus."	10/83:126		III	A guide to the III's system expansion port.
Chipman	"Do-It-Yourself Computer."	3/83:298			The LNW-80: a versatile and inexpensive upgrade.
Cole	"The 80 Goes Color."	5/83:90		I, III	Color for the Model III.

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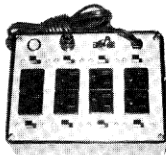
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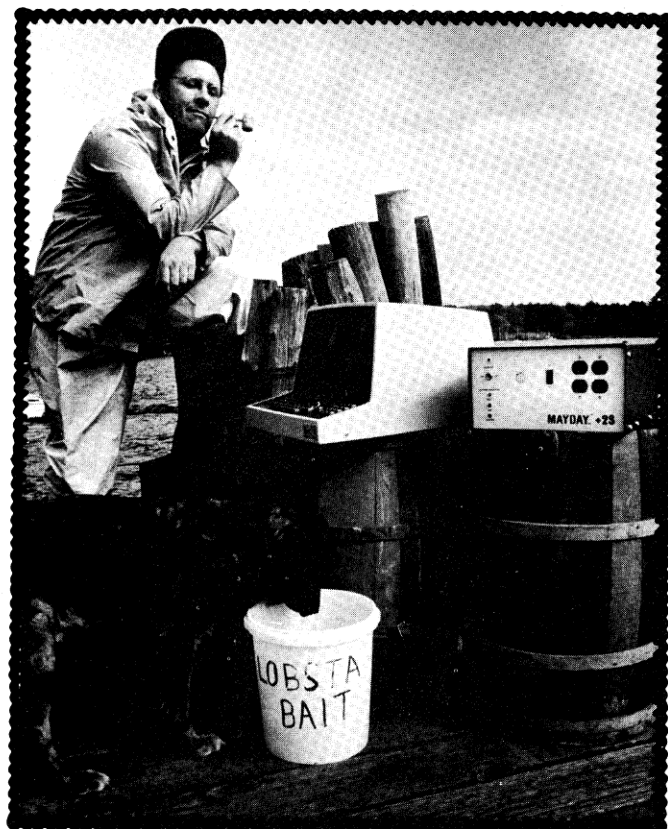
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Cole	"The 80 Goes Color—Part II."	6/83:116		I, III	USR routines to enhance your programming of color graphics.
Cole	"Judge 80."	1/83:221	6/83:22	I	The TRS-80 becomes a soapbox derby judge.
Conroy	"Homebrew Green Screen."	A/83:588			Building your own filter for your video screen.
Conviser	"The Murphy Box."	4/83:300			Use this device to diagnose your acoustic coupler's problems.
Craft & Beplat	"Decoding Bar Codes."	11/83:128		III	Programs that let your Model III read bar codes.
Crew	"Meet the MC68000."	10/83:120		16	A look at the 16 CPU's features for Assembly programmers.
DeTray	"Your First Hardware Project."	3/83:124			An easy hardware-starter kit for the novice.
DeTray	"Hardware Hacker's Tool Kit."	3/83:156			Tools you need to start your career as a hardware hacker.
Deininger	"Remote Robot."	11/83:269		100	A program that controls Radio Shack's radio-controlled robot.
Engelhardt	"Real World, It's About Time!"	3/83:342		III	How to devise a clock that keeps real time.
Engelhardt	"Real-World Control—Part I."	11/83:216		III	Using your computer to monitor home functions.
Engelhardt	"Real-World Control—Part II."	12/83:152		III	Letting your Model III run household appliances.
Fisher	"Interrupt Your 80."	1/83:258		I	A hardware modification to interrupt your TRS-80.
Gangwisch	"Color Black Box."	4/83:232		CoCo	Untangle your RS-232 cables.
Hart	"OMNIPROM."	4/83:262		I	A nearly universal EPROM programmer.
Hartmann	"Making a Weak Link Stronger."	7/83:286			How to cope with the TRS-80's screen.
Hartmann	"Portable Word Processor."	9/83:272		III	Use the Sony Typecorder and your III to create a powerful writing combination.
Lisowski	"Circuit Board Scanner."	5/83:152		I, III	Using Scripsit to help you find PC board part locations.
Mahoney	"Build an EPROM Programmer."	6/83:200	8/83:26	CoCo	Put your favorite programs in ROM packs.
Martel & Nicholas	"Drop Your Color Computer Into Disk Drive."	2/83:282		CoCo	Upgrading your CoCo to disk drives.
McGarvey	"Permanent Sound."	A/83:186		I	Installing an internal sound amplifier in your computer.
Michel & May	"Ultimate Joystick Interface."	A/83:592		I	A cheap and easy-to-build joystick interface.
Moses	"Color Computer Light Pen."	5/83:110		CoCo	Enjoy faster and easier input of data with this inexpensive light pen.
Navarrete	"Build It Yourself."	7/83:138		CoCo	A simple serial interface for the MX-80 and CoCo.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Build your own inexpensive modem cable.
Parris	"A Port Mapped A/D Converter."	1/83:358		I	Monitor your freezer and play Pong, too.
Schaefer	"More Memory for Peanuts."	A/83:216		III	Adding memory to your III.
Van Praag	"Hardware Hacker Help."	7/83:274			Analyzing PSI circuitry problems.

HOME/HOBBY

Author	Title	Issue:Page	Debug	Model	Annotation
Cole	"Judge 80."	1/83:221	6/83:22	I	The TRS-80 becomes a soapbox derby judge.
Deininger	"Remote Robot."	11/83:269		100	A program that controls Radio Shack's radio-controlled robot.
Engelhardt	"Real-World Control—Part I."	11/83:216		III	Using your computer to monitor home functions.
Engelhardt	"Real-World Control—Part II."	12/83:152		III	Letting your III run household appliances.
Freese	"Music-80."	3/83:310		I	Belt out your favorite tunes with this music interpreter.
Hoppesch	"Bowling Statistician."	4/83:218		III	Let a TRS-80 keep track of the pins.
Jarvela	"To Market, To Market."	10/83:276		100	A portable shopping list program.
Lisowski	"Circuit Board Scanner."	5/83:152		I, III	Use Scripsit to help you find PC board part locations.
Morgenstern	"Dual-Voice Music Synthesizer."	A/83:253	6/83:22, 11/83:24	I, III	How to get your computer to play multinites.
Robichaux	"To Boldly Go..."	A/83:156	5/83:27	I, III	Using a computer to help find position and distances of stars.

INPUT/OUTPUT

Author	Title	Issue:Page	Debug	Model	Annotation
Baker	"Using Data Files—Part I."	6/83:258		I, II, III	Learning how to handle data files correctly.
Barbarelo	"Model II Real-World Input/Output."	6/83:270		II	A capacitance meter that lets your computer communicate with the outside world.
Beer	"Lisp: Basically Speaking—Part III."	5/83:306			Learning about I/O methods, temporary variables, saving definitions, and more.
Cameron	"Using the Model III I/O Bus."	10/83:126		III	A guide to the III's system expansion port.
Craft & Beplat	"Decoding Bar Codes."	11/83:128		III	Programs that let your III read bar codes.
Engelhardt	"Real-World Control—Part I."	11/83:216		III	Using your computer to monitor home functions.
Haan	"Assembly-Language Disk I/O."	12/83:88		III	Mastering Assembly-language's I/O techniques for more efficient programs.
Kepner	"Mod II Random Access."	2/83:280		II	A description of how the II random access really works.
Lindsly	"Drivers and DCBs."	6/83:68		I, III	ROM subroutines that teach you all about machine-language programming.
Mabry	"Profile File Transfer."	7/83:290	10/83:22	I, III	An easy Basic program that puts Profile data in new files.
Mendez	"Hello Bar Codes, Goodbye Keyboard?"	11/83:94			An introduction to bar codes and bar-code readers.
Miller	"Into the 232."	A/83:582			The scoop about the RS-232 port.
Morra	"Disk Mysteries Revealed."	A/83:44			Everything you ever wanted to know about floppy disks.
Moses	"Color Computer Light Pen."	5/83:110		CoCo	Enjoy faster and easier input of data with this inexpensive light pen.
Moyer	"Auto-Dial/Auto-Answer."	A/83:300		I	An addition to your modem that lets your computer answer and dial your phone automatically.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Shows how to build your own inexpensive modem cable.
Quindry	"Easy Loader."	3/83:260		I	Basic to machine language to CLOAD.
Rucks	"Model III Relative Files."	A/83:78		III	Overcoming the drawbacks of direct-access files by using relative files accessed by the scatter technique.

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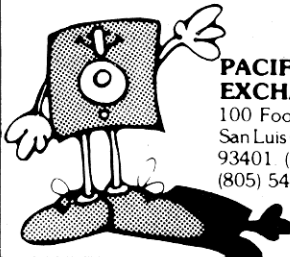
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Thornton	"Bars and Stripes Forever."	11/83:104	III	A look at industrial bar codes, with three popular styles for your III.
Thornton	"Check-Out UPCs."	11/83:114	I, III	How to create and print UPC codes.
Townsend	"Rapid Random Access."	A/83:298	I, III	Find specific records quickly, even if you have 10,000 records.

INTERFACE

Author	Title	Issue:Page	Debug	Model	Annotation
Aldrich	"Satellite Word Processing."	9/83:180		I, III, CoCo	Use your CoCo as a satellite terminal.
Barbarelo	"Model II Real-World Input-Output."	6/83:270		II	A capacitance meter that lets your computer communicate with the outside world.
Barbarelo	"The Biobox."	10/83:176		II	A biofeedback interface that helps you monitor stress.
Cameron	"Using the Model III I/O Bus."	10/83:126		III	A guide to the III's system expansion port.
Cole	"Judge 80."	1/83:221	6/83:22	I	The TRS-80 becomes a soapbox derby judge.
Craft & Beplat	"Decoding Bar Codes."	11/83:128		III	Programs that let your III read bar codes.
Deiningner	"Remote Robot."	11/83:269		100	A program that controls Radio Shack's radio-controlled robot.
Engelhardt	"Real World, It's About Time!"	3/83:342		III	How to devise a clock that keeps real time.
Engelhardt	"Real-World Control—Part I."	11/83:216		III	Using your computer to monitor home functions.
Engelhardt	"Real-World Control—Part II."	12/83:152		III	Letting your III run household appliances.
Hartmann	"Portable Word Processor."	9/83:272		III	Use the Sony Typecorder and your III to create a powerful writing combination.
Michel & May	"Ultimate Joystick Interface."	A/83:592		I	A cheap and easy-to-build joystick interface.
Miller	"Into the 232."	A/83:582			The scoop about the RS-232 port.
Navarrete	"Build It Yourself."	7/83:138		CoCo	A simple serial interface for the MX-80 and CoCo.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	How to build your own inexpensive modem cable.
Parris	"A Port Mapped A/D Converter."	1/83:358		I	How to monitor your freezer and play Pong, too.
Payne	"Talk to the Big Guys."	9/83:230	12/83:20	III	A dumb-terminal program.
Van Praag	"Hardware Hacker—Part IV."	1/83:132			Combines 1982 projects in a peripheral support system.

OPERATING SYSTEMS

Author	Title	Issue:Page	Debug	Model	Annotation
Busch	"DROSSDOS/8E."	1/83:342		I, III	KTI takes on the world of disk operating systems.
Castor	"Cassette Operating System."	3/83:226		I, III	Data-base management with a tape-based system.
Hawkes	"Using Unix-Xenix—Part I."	11/83:212		16	All about the new operating system that gives 16-bit micros mainframe capabilities.
Odneal	"FLEX for the Color Computer."	4/83:144		CoCo	Combining the Color Computer's disk system with the versatile and inexpensive FLEX disk operating system.
Pollard	"Fast Tape Operating System."	A/83:220		I	FTOS lets you use disk commands to increase the speed of storage time in your cassette system.
Quindry	"NODOS 80."	A/83:96		I, III	Getting features of disk operating systems on cassette.

RS-232

Author	Title	Issue:Page	Debug	Model	Annotation
Aldrich	"Satellite Word Processing."	9/83:180		I, III, CoCo	Using your Color Computer as a satellite terminal.
Barbier	"Nothing's Perfect."	8/83:209		100	A closer look at the 100.
Bogardus	"CC DLOAD."	3/83:190		I	Linking the Color Computer to the I via the DLOAD command.
Conviser	"The Murphy Box."	4/83:300			Use this device to diagnose your acoustic coupler's problems.
Craft & Beplat	"Decoding Bar Codes."	11/83:128		III	Programs that let your III read bar codes.
Gangwisch	"Color Black Box."	4/83:232		CoCo	Stop switching your RS-232 cables around. Build this black box and leave them plugged in.
Hartmann	"Portable Word Processor."	9/83:272		III	Using the Sony Typecorder and your III to create a powerful writing combination.
Miller	"Into the 232."	A/83:582			The scoop about the RS-232 port.
Moyer	"Auto-Dial/Auto-Answer."	A/83:300		I	An addition to your modem that lets your computer answer and dial your phone automatically.
Navarrete	"Build It Yourself."	7/83:138		CoCo	A simple serial interface for the MX-80 and the Color Computer.
Oppedahl	"Make Your Own Modem Cable."	12/83:244		100	Shows how to build your own inexpensive modem cable.

SCIENCE

Author	Title	Issue:Page	Debug	Model	Annotation
Barbarelo	"The Biobox."	10/83:176		II	A biofeedback interface that helps you monitor your stress.
Bledenweg	"Refrigerator Controller."	2/83:212		I	Control the lighting and temperature of your refrigerator for science projects.
Boyd	"Memory Exerciser."	4/83:332		II, 16	Let your computer help strengthen your memory.
Carrera	"Planetary Orbits."	1/83:156		I, III	Calculates a planet's location.
Conviser	"Physically Astronomical."	10/83:148		CoCo	Three programs that help you understand relativity and learn about star systems.
Durell	"Brief Exposures."	10/83:236		I, III	A tachistoscope program that tests your perceptions.
Eisenberg	"Consulting the I Ching."	10/83:267		100	Finding guidance to problems with the 100.

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Faske	"Life with the Model II."	10/83:136		II	Using your computer to examine the population cycles of a community of living organisms.
Fox	"Ephemeris for Comets and Minor Planets."	10/83:90		I, III	Projects the positions of comets and asteroids.
Harris	"Catching Rays."	10/83:256		I, III	Calculates the sun's altitude and azimuth.
Keen & Dischert	"Channels of Communication."	12/83:140		I, III	How to access over 140 TV stations with a satellite dish.
Lilly	"What's Up and When."	10/83:114		III	Finds and names any constellation you are looking for.
Morgenstern	"Maxwell's Demon."	8/83:234		I, III	Learning thermodynamics the fun way.
Perry	"Color Life."	2/83:314		CoCo	Learning about the development of communities of organisms.
Sarnow	"Molecular Matters."	10/83:100		I, III	The molecular orbital theories of chemistry made easy on the I/III.

SECURITY

<i>Author</i>	<i>Title</i>	<i>Issue:Page</i>	<i>Debug</i>	<i>Model</i>	<i>Annotation</i>
Brothers & Durbin	"Computer Security with a Credit Card."	3/83:74		I	Limited computer access with a credit card.
Engelhardt	"Real-World Control—Part I"	11/83:216		III	How to build a port I/O board to control your household appliances.
Engelhardt	"Real-World Control—Part II."	12/83:152		III	Letting your III run household appliances.
Lantis	"The Password Is . . ."	12/83:179		4	About removing password protection from your DOS.

SERIES

<i>Author</i>	<i>Title</i>	<i>Issue:Page</i>	<i>Debug</i>	<i>Model</i>	<i>Annotation</i>
Andreassen	"The Art of Encoding and Decoding."	A/83:530		II, 16	Keeping your correspondence private with code.
Andreassen	"The Art of Encoding and Decoding."	2/83:244		II, 16	Translates your cryptic files into readable form.
Andreassen	"The Magic Matrix—Cryptology, Part III."	4/83:291		II, 16	Learn the background of secret ciphers.
Andreassen	"Letter-Frequency Distribution—Cryptology, Part IV."	6/83:190		II, 16	Using letter-frequency distribution to crack ciphertext.
Andreassen	"Scrambled Alphabets—Cryptology, Part V."	11/83:234		II, 12, 16, I, III, 100	Rearranging letters to encrypt data files.
Beer	"Lisp: Basically Speaking—Part I."	3/83:176	7/83:22, 8/83:26	I, II, III, 16	All about Lisp, a language that uses objects instead of numbers.
Beer	"Lisp: Basically Speaking—Part II."	4/83:254			Learning Lisp's LAMBDA, NLAMBDA, and DEFINE atoms.
Beer	"Lisp: Basically Speaking—Part III."	5/83:306			Learning about I/O methods, temporary variables, saving definitions, and more.
Bowker	"Assembly-Language Shortcuts—Part I."	6/83:173		I, III	Simple tricks to make writing Assembly-language programs an easier process.
Bowker	"Assembly-Language Shortcuts—Part II."	12/83:116		I, III	More simple tricks of Assembly-language programming.
Chidsey	"Bit Smitten—Part VI."	1/83:316		I, III	Teaches you how to create nice looking title and credit pages for your programs.
Corbani	"Basic, Faster and Readable—Part I."	6/83:104		I, III	The grammar of Microsoft Basic.
Corbani	"Basic, Faster and Readable—Part II."	7/83:200		I, III	Conditional testing and utilizing MBasic.
Corbani	"Basic, Faster and Readable—Part III."	11/83:228		I, III	How to save time by speeding up Basic loops.
Corbani	"Basic, Faster and Readable—Part IV."	12/83:174		I, III	How to make variables work for you.
Grothman	"APL Primer—Part II."	1/83:302			How to use vectors in APL on your TRS-80.
Grothman	"APL Primer—Part III."	2/83:260			A bonanza of functions for your computer.
Grothman	"APL Primer—Part IV."	3/83:200			Learn all about transposing a matrix.
Grothman	"APL Primer—Part V."	4/83:157			All about pi and trig functions, statistics, determinants, and the quadratic formula.
Keller	"The Printer as a Paintbrush—Part I."	5/83:218		I	Learning to use dot-addressable graphics.
Keller	"The Printer as a Paintbrush—Part II."	6/83:282		I	Reproducing the finer shading levels.

TECHNIQUES

<i>Author</i>	<i>Title</i>	<i>Issue:Page</i>	<i>Debug</i>	<i>Model</i>	<i>Annotation</i>
Andreassen	"The Art of Encoding and Decoding."	A/83:530		II	Keeping your correspondence private with code.
Andreassen	"The Art of Encoding and Decoding."	2/83:244		II, 16	Translates your cryptic files into readable form.
Andreassen	"The Magic Matrix—Cryptology, Part III."	4/83:291		II, 12, 16	Learn the background of secret ciphers.
Andreassen	"Letter-Frequency Distribution—Cryptology, Part IV."	6/83:190		II, 16	Using letter-frequency distribution to crack ciphertext.
Andreassen	"Scrambled Alphabets—Cryptology, Part V."	11/83:234		II, 12, 16, I, III, 100	Rearranging letters to encrypt data files.
Baker	"Using Data Files—Part I."	6/83:258		I, II, III	Learning how to handle data files correctly.
Berman	"Block Letters for the Mod II."	1/83:178		II, 16	Print block letter titles on your fanfold printouts.
Blair	"Towards Better Programming."	A/83:82		I, III	Improving your programming with Program Development Language and the Scientific Method.

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Bowker	"Assembly-Language Shortcuts—Part I."	6/83:173		I, III	Simple tricks to make writing Assembly-language programs an easier process.
Bowker	"Assembly-Language Shortcuts—Part II."	12/83:116		I, III	More simple tricks of Assembly-language programming.
Bunch & Lisi	"Which Way the Wind Blows."	7/83:130		I, III	A weather data base.
Cataldo	"Building a Better Adventure."	1/83:268		I, III	Knowing about parsing helps you to create better games.
Clapp	"Linear Programming."	A/83:70		I	Using linear programming to help analyze your decision problems.
Clinger	"Tiger Graphics."	A/83:326		I	Graphic techniques for the IDS Paper Tiger printer.
Corbani	"MiniCalc."	5/83:140		I, III	Applying matrix logic to business applications.
Corbani	"Basic, Faster and Readable—Part I."	6/83:104		I, III	The grammar of Microsoft Basic.
Corbani	"Basic, Faster and Readable—Part II."	7/83:200		I, III	Makes conditional tests easier by tailoring the logic to the expected input.
Cranmer	"Windchill Determiner."	1/83:238		III	Determines just how cold those winter mornings really are.
Curtis	"Teach Your CC New Words."	A/83:408		CoCo	Adding commands, statements, and functions to Color Basic.
Dihopolsky	"My Foe Flicker."	8/83:124		III	Keeping your electron gun on target, and eliminating video flicker.
Haan	"Assembly-Language Disk I/O."	12/83:88		III	Mastering Assembly-language's I/O techniques for more efficient programs.
Kalinowski	"PRINT @ Graphics."	3/83:164		I, III	Demonstration programs that help you produce graphics and improve your programming skills.
Keen & Dischert	"Programming the Model 16."	6/83:244		16	Everything you need to know about programming the 68000 chip.
Kell	"Saving Strings."	9/83:116		I, III	A very fast and powerful INKEY\$ routine.
Lindsly	"Drivers and DCBs."	6/83:68		I, III	ROM subroutines that teach you all about machine-language programming.
McTernan	"Optimize Your Code."	1/83:270		I	Making your programs run faster with help from a stopwatch.
Miller	"Compress It."	3/83:336		I, II, III, CoCo	Squeeze a 12K program into a 4K computer.
Mills	"Partially Disabled Break."	1/83:197	5/83:27	I, III	Salvation for accidentally hitting the break key.
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Reardon	"Secret Ciphers."	3/83:208		I, II, III	A public-key cipher system that is almost unbreakable.
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Rideout	"Using DEFFN."	A/83:196		I, III	Save memory and simplify your programs with the DEFFN statement.
Rifkin	"Self-Modifying Programs."	3/83:252		I, III	Gets rid of clumsy duplications of code.
Rucks	"Model III Relative Files."	A/83:78		III	Overcoming the drawbacks of direct-access files by using relative files accessed by the scatter technique.
Saisi	"The Poop on PEEK."	3/83:278		CoCo	Give your arms a rest during fast games by using PEEK instead of INKEY\$.
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Sprouse	"Mailing List Compiler."	1/83:126	5/83:27	CoCo	Color Computer mailing list program.
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Townsend	"Rapid Random Access."	A/83:298		I, III	Find specific records quickly, even if you have 10,000 records.
Weide	"Testing Your New RAM."	3/83:150		CoCo	Locating the problem of why your added memory doesn't work.
Whitney	"Coping with Cassettes."	A/83:590			Maintenance procedures for your cassette recorder.
Wood	"Expanded Color Capabilities."	A/83:486		CoCo	Display four colors on your Color Computer's screen at one time.

TUTORIAL

Author	Title	Issue:Page	Debug	Model	Annotation
Andreassen	"The Art of Encoding and Decoding."	A/83:530		II, 16	Keeping your correspondence private with code.
Andreassen	"The Art of Encoding and Decoding."	2/83:244		II, 16	Translates your cryptic files into readable form.
Andreassen	"The Magic Matrix— Cryptography, Part III."	4/83:291		II, 16	Learn the background of secret ciphers.
Andreassen	"Letter-Frequency Distribution— Cryptography, Part IV."	6/83:190		II, 16	Using letter-frequency distribution to crack ciphertext.
Andreassen	"Scrambled Alphabets— Cryptography, Part V."	11/83:234		II, 12, 16, I, III, 100	Rearranging letters to encrypt data files.
Barden	"Assembly-Language Primer."	A/83:16	6/83:23	I, III	Making the plunge into Assembly language.
Beer	"Lisp: Basically Speaking—Part I."	3/83:176	7/83:22, 8/83:28	I, II, III, 16	All about Lisp, a language that uses objects instead of numbers.
Beer	"Lisp: Basically Speaking—Part II."	4/83:254			Learning Lisp's LAMBDA, NLAMBDA, and DEFINE atoms.
Beer	"Lisp: Basically Speaking—Part III."	5/83:306			Learning about I/O methods, temporary variables, saving definitions, and more.
Bowker	"Assembly-Language Shortcuts—Part I."	6/83:173		I, III	Simple tricks to make writing Assembly-language programs an easier process.

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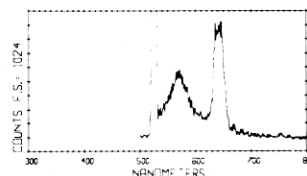
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Brothers	"Assembly Language Made Simple—Part I."	12/83:74	I, III		An introduction to writing Assembly programs: How the Z80 processes instructions.
Busch	"Nine Programming Tricks."	A/83:56			Shortcuts to faster Basic programming.
Chidsey	"Bit Smitten—Part VI."	1/83:316	I, III		Teaches you how to create nice looking title and credit pages for your programs.
Colle	"Color Sketchpad."	6/83:110	11/83:24	CoCo	Your Color Computer's keyboard helps you design graphics.
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Corbani	"Basic, Faster and Readable—Part IV."	12/83:174	I, III		How to make variables work for you.
Crew	"Meet the MC68000."	10/83:120	16		A look at the 16 CPU's features for Assembly programmers.
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DeTray	"Hardware Hacker's Tool Kit."	3/83:156			Tools you need to start your career as a hardware hacker.
Eisenberg	"Aid for AIDS-III."	9/83:216	I, III		Getting the most out of this data-base manager.
Engelhardt	"Take It Off."	12/83:177	4		How to crack TRSDOS 6.0's password so that you can erase utilities and clear disk space.
Esposito	"Binary Breakfast."	A/83:50	I, III, CoCo		Understanding the binary system your computer uses.
Grant	"Mod II CRT Controller."	7/83:208	II, 12, 16		Program the II's chip and control up to 16 screen functions.
Grothman	"APL Primer—Part II."	1/83:302			How to use vectors in APL on your TRS-80.
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Grothman	"APL Primer—Part IV."	3/83:200			Learn all about transposing a matrix.
Grothman	"APL Primer—Part V."	4/83:157			All about pi and trig functions, statistics, determinants, and the quadratic formula.
Hansen	"How to Buy a Printer."	A/83:572			Good advice on how to select a printer.
Harrell	"A Pascal Primer."	7/83:94	11/83:24	I, III	Learning Pascal while playing cribbage.
Harrell	"Fortran Breakout."	7/83:186	12/83:20	I, III	A popular game speeded up with Fortran.
Hawkes	"Using Unix-Xenix—Part I."	11/83:212	16		All about the new operating system that gives 16-bit micros mainframe capabilities.
Keen & Dischert	"Ribbon Rewind."	A/83:586			Save money by rewinding multistrike carbon ribbons for your Daisy Wheel II printer.
Keller	"The Data Base Explained."	A/83:32			An introduction to data bases.
Kepner	"Mod II Random Access."	2/83:280	II		A description of how the II random access really works.
Martel & Nicholas	"La Plume de Ma Tante."	7/83:78	11/83:24		An overview of popular computer languages.
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Weersing	"The Sum of its Parts."	A/83:60			How to go about writing a Basic program.

UTILITY

Author	Title	Issue:Page	Debug	Model	Annotation
Baker	"PENRAM."	1/83:276		I	A machine-language utility to edit random access memory.
Balewski	"Super Spooler."	A/83:144		I	Use your computer while it's printing.
Balonis	"Program Length."	12/83:246		100	Compute program length to manage memory space on the 100.
Barak	"Statements in Common."	5/83:144		I, II, III	Transferring data from one program to another.
Barbarelo	"Take a Letter . . ."	A/83:558		II, 16	Draw large block letters using regular size letters, any printer, and a II.
Barbarelo	"Space Maker."	11/83:186		II, 16	Inserting spaces into your compressed program listings.
Barbarelo	"BRKSEL"	A/83:534		II	Disable the break key with this program.
Belcher	"Screen Format Program Generator."	2/83:296		I, III	Figure screen locations, field prompts, and input fields.

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Bogardus	"CC DLOAD."	3/83:190		I	Linking the CoCo to the I via the DLOAD command.
Borrmann	"Spacemap."	9/83:184		I	A track-by-track disk directory for the I.
Busch	"Nine Programming Tricks."	A/83:56			Shortcuts to faster Basic programming.
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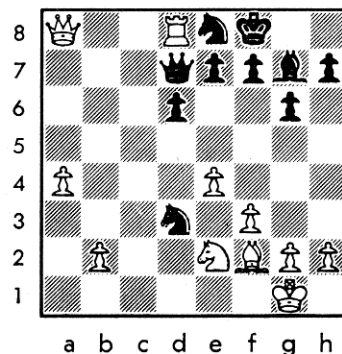
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12. d5-b6	d7-b7	28. d4-c4	a7-c6
13. b6-a8	b7-a8	29. b8-a8	c6-e5
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Knight	"Make Your Word(s) Count."	11/83:204		I, III	Find the number of words in a Scripsit file.
Phillipp	"Dvorak Meets Scripsit."	5/83:294		I	Who needed QWERTY anyway?
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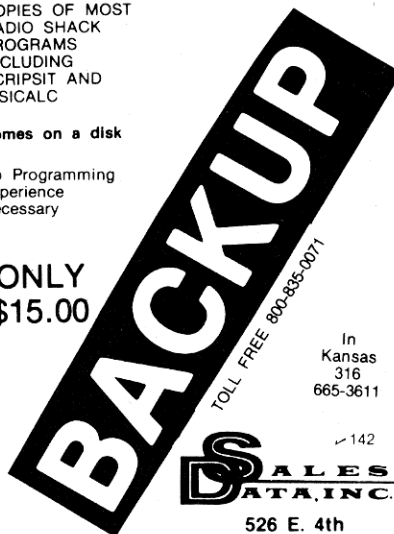
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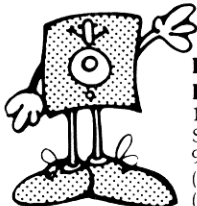
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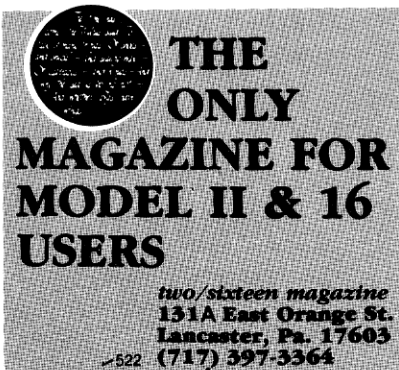
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